The Malleability of Implicit Motives:

How Basic Motivational Orientations are Affected by Time, Situations, and People

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Abstract

Researchers often assume that implicit motives are stable personality characteristics that are formed exclusively in the early childhood due to affective experiences. So far, the stability of implicit motives has rarely been questioned. However, it is nowadays common knowledge that individuals experience some changes in their personality over the life span. The present thesis is devoted to the question if implicit motives are in fact as stable as assumed or if they are susceptible to change. For this purpose, recent studies on stability and changeability of implicit motives are reviewed in the first part, whereas age differences in implicit motives and possible underlying reasons are investigated in the second part. The third part addresses the changeability of implicit motives within romantic relationships that might be an important and long-term influence on individual characteristics. Finally, consequences of these changes on certain aspects of romantic relationships are demonstrated in the fourth part. In sum, this thesis provides some first evidence that implicit motives can change according to individual reasons, such as maturation, as well as according to the influence of specific life circumstances, such as long-term intimate relationships. Besides, it shows that these changes are functional for the communication within relationships.

Zusammenfassung

Innerhalb der Literatur werden implizite Motive häufig als stabile Persönlichkeitseigenschaften verstanden, die sich aufgrund affektiver Lernerfahrungen ausschliesslich in frühster Kindheit entwickeln. Diese Stabilitätsannahme wurde bislang nur selten angezweifelt. Mittlerweile ist jedoch weitläufig bekannt, dass sich zahlreiche Persönlichkeitseigenschaften über die Lebensspanne hinweg verändern. Diese Dissertation widmet sich der Frage, ob implizite Motive tatsächlich stabil sind oder ob sie veränderbar sind. Zu diesem Zweck wurden in einem ersten Teil bisherige Studien zur Stabilität und Veränderbarkeit impliziter Motive zusammengetragen, während in einem zweiten Teil Altersunterschiede bei impliziten Motiven und zugrundeliegende Ursachen untersucht wurden. Die Veränderbarkeit impliziter Motive aufgrund intimer Partnerschaften, welche einen starken Einfluss auf die Entwicklung individueller Persönlichkeitseigenschaften haben können, wurde in einem dritten Teil empirisch betrachtet. Der vierte Teil beschreibt die Konsequenzen einer solchen Motivveränderung für das Kommunikationsverhalten zwischen Partnern. Zusammenfassend zeigt sich, dass es hinreichende Belege für die Veränderbarkeit impliziter Motive gibt. Individuelle Reifungsprozesse sowie gewisse Lebensbedingungen, wie beispielsweise intime Beziehungen, können Motive verändern. Gerade im Bereich der partnerschaftlichen Kommunikation kann eine solche Veränderung als funktional begriffen werden.

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This thesis is a result of a long process accompanied by sweat and blood (but no tears!). Although there were many obstacles and setbacks, there were also various enlightenments and learning experiences (by the way: As you will see soon, the latter is an important topic in this thesis).

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Summary

Up to now many researchers have granted the assumption that implicit motives are acquired through affective experiences in early, prelingual childhood and remain stable personality characteristics over the lifespan and, thus, do not change (e.g., Rheinberg & Engeser, 2010). However, it has already been known that many characteristics of the personality change over the course of life (e.g., Roberts, Walton, & Viechtbauer, 2006). So, to no surprise, there is even empirical research that provides first longitudinal evidence for rejecting the assumption about life-time stability in implicit motives (e.g., Franz, 1994). The present thesis is devoted to the question if implicit motives are in fact as stable as assumed across various situations and over the course of life or if they are susceptible to change. This thesis addresses the issue of stability and changeability of implicit motives in the first two parts in a general way, reviewing present research and investigating age differences, and expands it in the third and fourth part to intimate relationships as an important area of life that has strong impact on various individual characteristics.

The first part reviews existing literature and empirical studies concerning stability and changeability of implicit motives. It summarizes and discusses studies that (1) aroused implicit motives experimentally through imagination tasks, preceding behavior, or training exercises, (2) investigated age differences in implicit motives, (3) or longitudinally analyzed implicit motives. These studies provide evidence that implicit motives are in fact susceptible to change according to the influence of specific environmental factors and life circumstances.

The second part examines age differences in implicit motives in a large community sample of adults aged from 20 years to 80 years. This research analyses the implicit motive scores of individuals aged within a range of 60 years and provides evidence that implicit motives differ between older and younger individuals, suggesting a change over the life-span. The findings indicate lower motive scores in all measured motives in older as compared to younger adults. Further, age-dependent changes in affective and neuroendocrinological processes are discussed as a cause of age differences in implicit motives.

Intimate relationships might also influence the individual motive disposition because individuals spend a large part of their life with their intimate partner. Thus, a third part empirically investigates if spouses converge to each other in their implicit motives over the course of their relationship. Besides, the third part compares the change in implicit motives to a change in life goals. Results suggest that the relationship might influence the individual

motive disposition. In contrast to life goals, spouses become increasingly similar to each other in their implicit motives as their relationship duration increases.

The last part investigates the consequences of spouses' similarity in their implicit motives for the relationship, focusing on the implicit intimacy motive. One might assume that the above mentioned changes in implicit motives result in convergence and, consequently, the similarity in implicit motives might affect the intimate relationship in a positive way, for example, enhancing partners' coordination of nonverbal behavior (nonverbal synchrony) in a conflict discussion. However, our results show that a similarity in the implicit intimacy motive does not affect the coordination of nonverbal behavior positively. Detailed analyses indicate that individuals adapt their nonverbal behavior only to the nonverbal behavior of the partner if only one partner has a high need for intimacy.

To sum up, the present thesis demonstrates that implicit motives can change according to individual reasons, such as maturation, as well as according to the influence of specific life circumstances, such as long-term intimate relationships. Besides, it shows that these changes are functional for the communication in the relationship. Limitations of the present research and continuative research topics are discussed in the general discussion at the end.

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General Introduction

"Change is the law of life. And those who look only to the past or the present are certain to miss the future."

John F. Kennedy, 1963

In the past, researchers in the field of personality assumed that adults do not change in their personality dispositions, or at least only to a very small amount (McCrae & Costa, 1984). For example, they supposed that personality characteristics such as conscientiousness, neuroticism, openness, extraversion, and agreeableness are very stable characteristics (Costa & McCrae, 1997; McCrae & Costa, 1990). However, it is nowadays common knowledge that individuals experience some changes in their personality during their lifetime (Roberts et al., 2006). Researchers repeatedly provided evidence that personality traits, such as the above mentioned "big five", change to some degree during the course of life (for an overview and a meta-analysis: Helson, Kwan, John, & Jones, 2002; Roberts et al., 2006). Individuals go through various experiences, life events and changes during their lives. Thus, a change in important personality characteristics seems fairly straightforward. For example, developmental psychologists argue that such changes are absolutely necessary to maximize individual profits and to minimize losses (e.g., according to age-related degradation; Baltes, 1987, 1997). The former president of the United States of America, John F. Kennedy (1963), mentioned in one of his speeches that "change is the law of life" and that humans would not be well advised "to resist the pace of progress [if they don't want] to miss the future". This speech can easily be applied to the context of personality characteristics: It seems generally advantageous for individuals to adapt their characteristics to their life circumstances. These may include, for example, life transitions or life stages with specific challenges, critical life events, age-related psychological and physiological changes, or the permanent influence of significant others, such as the romantic partner (e.g., Anusic & Schimmack, 2016; Hudson & Fraley, 2015; Roberts et al., 2006; Specht, Egloff, & Schmukle, 2011).

Due to the multitude of these possible life circumstances, it seems likely that such adaption processes affect not only personality characteristics in terms of traits, such as the big five, but also motivational constructs that can be considered as another important part of the personality (Winter, 1996). This applies in particular to implicit motives because they cover a

different aspect of the personality and predict different behavior than traits (Winter, John, Stewart, Klohnen, & Duncan, 1998). Implicit motives are defined as affect driven, motivational dispositions that provide behavior with energy in order to satisfy specific needs (McClelland, 1985; Schultheiss, 2008). They are deemed to be early and prelingually acquired, enduring preferences for specific affectively toned incentives, and are considered to be a stable part of the individual personality (e.g., McClelland, 1985). For example, some individuals want to establish or maintain positive relationships when they communicate with others. On the contrary, some others prefer to exert influence or control over interaction partners in the same communication situation. The former is an example of the implicit affiliation motive, the latter of the implicit power motive.

Researchers often assume that implicit motives are stable characteristics that are formed exclusively in the early childhood due to affective experiences despite the knowledge of changing personality characteristics during the course of life (e.g., Rheinberg & Engeser, 2010). So far, the stability of implicit motives has rarely been questioned. The present thesis aims to address this issue and investigates how changeable implicit motives are. For this purpose, recent studies on the stability and changeability of implicit motives are reviewed in the first part, whereas age differences in implicit motives and possible reasons are investigated in the second part. The third part addresses the changeability of implicit motives within romantic relationships as an important and long-term influence on individual characteristics. Finally, consequences of these changes in implicit motives on the relationship are demonstrated in the fourth part. We begin by introducing the concept of implicit motives in more detail and close by discussing possible implications of the presented research.

Implicit Motives: Theoretical Background, Definition, and Measurement

From the very beginning of psychology, researchers were interested in investigating elementary psychological antecedents of any behavior (Rothermund & Eder, 2011). Thereby, not only conscious intentions and goals were deemed important but also specific unconscious needs that are not observable by others. These needs are termed implicit motives (McClelland, 1985; McClelland, Koestner, & Weinberger, 1989). They are defined as recurrent and unconscious needs or preferences that “are aimed at the attainment of specific classes of incentives and the avoidance of specific classes of disincentives” (Schultheiss, 2008, p. 603). These motivational dispositions orient and energize the individual behavior toward situations that are anticipated as rewarding (McClelland et al., 1989). Thus, they influence the perception and evaluation of specific situations that allow individual behavior (Rheinberg,

2008). For example, some individuals might feel positive emotions through influencing and controlling others in a group discussion, while other individuals might be happy when they can make new friends in the same situation.

Where does the construct of implicit motives originate from? Research on implicit motives has a very long tradition starting almost 70 years ago. David McClelland and John Atkinson were interested in measuring human motivational needs, in particular the hunger motivation (e.g., Atkinson & McClelland, 1948, 1958; McClelland & Atkinson, 1948). They decided not to rely on self-reports for their own measurement because they realized that the actual behavior of humans does not very often match with the information from their self-evaluation reports (Schultheiss & Brunstein, 2010). The researchers concluded that there must be other values or motives that are not easily discernable by the self or by others but influence the actual behavior (McClelland, 1984). A slightly modified version of the Thematic Apperception Test (TAT) from Morgan and Murray (1935) allowed them to measure unconscious needs of individuals without directly asking them. The TAT is a projective measure that asks subjects through specific guiding questions (e.g., "What is happening at the moment?") to write fantasy stories on ambiguous pictures. Murray (1938) already assumed that ambiguous picture cues arouse the needs and motives of subjects and that these unconscious motivational dispositions were projected into the pictures and, consequently, into the written imaginative stories. Later on, McClelland and Atkinson shifted their interest from hunger motivation to the implicit achievement motive because they thought that this need was more relevant for the individual success in their career and life in general (McClelland, 1961; Schultheiss & Brunstein, 2010). McClelland and his colleagues refined the definition of implicit motives and assumed that the incentive to show specific behavior rests entirely in the affective value of the outcome (McClelland, 1985). They referred, for example, to the pride of success, to the sadness of failure or the enjoyment of the activity itself (McClelland, 1985). Consequently, they assumed that a "motive is the learned result of pairing cues with affect or the conditions which produced affect" (McClelland, Atkinson, Clark, & Lowell, 1953, p. 75).

The research group of McClelland added an empirically derived content coding system for scoring the imaginative stories with the aim to create a standardized measurement of motivation. This coding system was later refined and simplified by Winter (1991). By providing a set of picture cues and the content coding system, the above mentioned research group had developed what has later been called the Picture Story Exercise (PSE; McClelland et al., 1989) to distinguish this empirically based motive measure from projective measures

developed in the context of clinical psychology such as the TAT (Schultheiss & Brunstein, 2010). Nowadays, the PSE uses four to eight pictures that illustrate humans acting in different social situations (e.g., a couple sitting on a bench by the river, a ship captain talking to another person; Schultheiss & Pang, 2007). The instructions for the testing procedure and the coding of the imaginative stories follow a standardized and reliable approach (Pang, 2010; Smith, 1992a; Winter, 1994). Over the years and in hundreds of studies, the PSE turned out to be a valid measurement and implicit motives a good predictor of operant behavior, such as performance (Biernat, 1989; Brunstein & Hoyer, 2002; deCharms, Morrison, Reitman, & McClelland, 1955) or affiliative behavior (e.g., McAdams & Constantian, 1983). Researchers even revealed a relationship between implicit motives and psychophysiological responses (e.g., hormonal correlates, Schultheiss, 2013) as well as health outcomes, such as stress, changed blood pressure and immune parameters (for an overview: McClelland, 1989). Due to the successful research and the heightened interest in implicit motives, research was extended to the investigation of the needs for power and affiliation (Schultheiss & Brunstein, 2010). Hence, the three basic motivational needs, achievement, power and affiliation, moved into scientists' focus of interest (Schultheiss & Brunstein, 2010).

Important Motive Systems

McClelland (1985) identified the need for achievement (nAch), the need for power (nPow), and the need for affiliation (nAff) as the three basic motivational needs. Although there is a number of other needs, such as hunger or sex, the above mentioned needs gained the most attention in research.

Achievement

As already stated, researchers were interested in the need for achievement for a long time. It is still the most intensively investigated need. The achievement motive is defined as the need to accomplish a difficult activity and to attain a high standard of excellence (McClelland, 1985; Murray, 1938; Smith, 1992a). Achievement motivated behavior can be found in all human beings to a varying degree. It shows up in different areas of life (e.g., school, sports, job) and is driven by anticipated emotions of goal attainment or even by failure in goal attainment (McClelland et al., 1953). Activities that are in accordance with this need, such as seeking for challenging tasks or setting high standards, help high-achievement motivated individuals to gain satisfaction (McClelland, 1985). Various studies demonstrated that the implicit achievement motive predicts specific behavior. For example, the achievement motive is positively associated with high scores on various performance tasks (Biernat, 1989;

Brunstein & Hoyer, 2002; deCharms et al., 1955), restless activity and moderate risk taking (McClelland, 1961), and even with entrepreneurial activity over time (McClelland, 1965, 1987). Besides, the implicit achievement motive is related to endocrinological responses such as the enhanced release of vasopressin (Schultheiss, 2013) and the reduced release of cortisol (Schultheiss, Wiemers, & Wolf, 2014; Yang, Ramsay, Schultheiss, & Pang, 2015). Vasopressin is associated with memory processes in the brain, whereas cortisol is released in stress situations (Schultheiss, 2013).

Due to the above mentioned positive consequences of the implicit achievement motive on economic and academic success, researchers were interested in improving and strengthening this need by training. Intervention studies that used specific exercises to strengthen the implicit achievement motive (e.g., theoretical inputs, self-awareness exercises) partially demonstrated significant increases in the context of economic growth (McClelland & Winter, 1969) and motivation in the classroom (deCharms, 1976a).

The achievement motive and its accompanying measures were originally investigated only in men. After a while, the research was extended to both sexes, but no differences in sex (Drescher & Schultheiss, 2016), and in behavior correlates (McClelland, 1985; Stewart & Chester, 1982) were found.

However, the need for achievement "is a one man game which need never involve other people" (McClelland, 1970, p. 30). Thus, this motive does not belong to the category of social motives and is often neglected in research that investigates implicit motives in social contexts such as intimate relationships. In these contexts, the implicit power and affiliation motives seem to be more relevant than the implicit achievement motive.

Power

Most definitions of power suggest that power is the capacity of an individual to influence others to show behavior that they would otherwise not show (Heckhausen & Heckhausen, 2010). Consequently, the implicit power motive is also defined as the "capacity to derive pleasure from having physical, mental, or emotional impact on other individuals or groups of individuals and to experience the impact of others … as aversive" (Schultheiss, 2008, p. 612). Power is often associated with negative behavior, such as compulsion, violence, domination and oppression (Magee & Langner, 2008). For example, research demonstrated that high power motivated individuals are more assertive in friendships (McAdams, Healy, & Krause, 1984), show more sexual aggression (Winter, 1973;

Zurbriggen, 2000), risk taking (McClelland & Watson, 1973) and engagement in war (Winter, 1987). However, power and especially having impact on others is not necessarily the same as being dominant (Schultheiss, 2008). Dominating others can be an objective of power but is rather only one aspect of it. The key focus of power is placed on influencing others. This is frequently achieved without aggressive and dominating behavior but through intelligent and strategic behavior (McClelland, 1985, 1985; Schultheiss, 2008). For example, high power motivated individuals are perceived by others in discussions and presentations as (highly) competent and convincing (Schultheiss & Brunstein, 2002). Thus, it can be assumed that power related behavior is not necessarily negative (Rheinberg, 2008). The implicit power motive can emerge in a prosocial way that is characterized by positive behaviors, such as charismatic leadership, education, balance of interests, and group cohesion (Heckhausen & Heckhausen, 2010). Research provides several different explanations for the prosocial influence of the implicit power motive (Hofer, Busch, Bond, Campos et al., 2010; Magee & Langner, 2008). Researchers assume that the interaction between a high implicit power motive and other personality characteristics, such as a high inhibitory tendency (McClelland, Davis, Kalin, & Wanner, 1972; Schultheiss & Brunstein, 2002), or a high sense of responsibility (Hofer, Busch, Bond, Campos et al., 2010; Winter, 1988; Winter & Barenbaum, 1985) causes a high desire for prosocial influence. Besides, differences in the prosocial manifestation of the implicit power motive might also be due to gender differences. High power motivated women behave in a more socially appropriate way than high power motivated men (Chusmir & Parker, 1984; McClelland, 1975; McClelland, 1985; Winter, 1988). Thus, there are two sides of the implicit power motive: the personalized and the socialized power motivation (McClelland, 1970). Individuals that act with personalized power concerns see the world “as something of a competitive jungle wherein a man must seek to win out over opponents” (McClelland et al., 1972, p. 160). Individuals high in the socialized power motive are concerned with prosocial impact seeking to promote others’ benefit (Hofer, Busch, Bond, Campos et al., 2010; Magee & Langner, 2008). The latter is, for example, related to charismatic leadership (McClelland & Burnham, 1976), generativity, parental involvement (Hofer, Busch, Chasiotis, Kärtner, & Campos, 2008; Peterson & Stewart, 1993), and voluntary work (Winter, McClelland, & Stewart, 1982).

The implicit power motive is also related to neuroendocrinological reactions, such as the release of testosterone and estradiol as well as cortisol and norepinephrine (Schultheiss, 2013; Schultheiss & Rohde, 2002). These hormones respond very sensitively to situations that involve social dominance (e.g., increase of testosterone and estradiol in a dominance contest)

Further, they are associated with behavioral expressions of social dominance (Schultheiss, 2013). Similar to the implicit achievement motive, there are no meta-analytical gender differences in the scores of the implicit power motive between women and men (Drescher & Schultheiss, 2016).

Affiliation

The implicit affiliation motive is another social motive. It involves the striving for satisfying interpersonal relationships and is defined as the capability to gain satisfaction from establishing, maintaining, or restoring positive relationships to others (Atkinson, Heyns, & Veroff, 1954; Schultheiss, 2008). Research evidences various behavioral outcomes of this motive. For example, individuals high in the implicit affiliation motive orient their attention especially toward emotional faces signaling rejection or acceptance (Schultheiss & Hale, 2007), avoid conflicts and competition with others (Langner & Winter, 2001; Terhune, 1968) and show more eye contact and laughing in interpersonal situations than individuals low in this motive (Hagemeyer, Dufner, & Denissen, 2016).

Moreover, the implicit affiliation motive is related to the release of dopamine and progesterone (McClelland, Patel, Stier, & Brown, 1987; Schultheiss, 2013). These hormones have relaxing and anxiolytic effects and are associated with the down-regulation of stress responses (Schultheiss, 2013). In contrast to the implicit achievement and power motives, several studies evidence significant gender differences in the implicit affiliation motive. Usually, women score higher in measures of the need for affiliation than men (Drescher & Schultheiss, 2016).

However, there is a dark side of the implicit affiliation motive: In addition to the strong striving for satisfying relationships, it also represents the fear of rejection and separation (Schultheiss, 2008). This is the downside of the implicit affiliation motive, tempting high affiliation motivated individuals to negative behaviors because they try to maintain a relationship at all costs (for an overview: Weinberger, Cotler, & Fishman, 2010). For example, such individuals are often perceived as more anxious, demanding, and, in some ways, more aggressive and disliked than others who are low in the implicit affiliation motive. Thus, Weinberger, Cotler, and Fishman (2010) stated that the implicit affiliation motive "leads to our greatest joy and our deepest sorrows" (p. 84). This fact has been taken into account by researchers: Nowadays, the implicit affiliation motive is mostly assessed together with a facet that specifically represents the concern for closeness and love (Winter, 1991). This facet is termed the implicit intimacy motive.

Intimacy

The implicit intimacy motive is a facet and an integral part of the implicit affiliation motive and its measurement (Weinberger et al., 2010; Winter, 1991, 1994). Thus, it equally belongs to the most investigated implicit motives. However, it is also possible to investigate the implicit intimacy motive separately from the implicit affiliation motive with an own specific coding system (McAdams, 1980, 1992). The implicit intimacy motive "is the capacity to love and to be loved" (McClelland, 1985, p. 365) and "is defined as a recurrent preference or readiness for experiences of warm, close, and communicative interaction with others" (McAdams & Bryant, 1987, p. 397). There is neither a dark side nor are there any avoidance components (Weinberger et al., 2010). A major difference between the implicit intimacy motive and the implicit affiliation motive is a strong focus on close and familiar relationships, whereas the implicit affiliation motive can be satisfied through any kind of social contact (McAdams, 1980). Research demonstrated significant relationships between the implicit intimacy motive and individual behavior as well as behavior in social interactions. For example, the implicit intimacy motive is related to high trust and self-disclosure (McAdams, Healy et al., 1984), to positive affect in interpersonal situations (McAdams & Constantian, 1983) and to high individual (McAdams & Bryant, 1987) and relationship satisfaction (Hagemeyer & Neyer, 2012; McAdams & Vaillant, 1982). In general, the implicit intimacy motive is associated with interpersonal behavior that produces harmony and conviviality (McAdams & Bryant, 1987). Besides, high-intimacy motivated individuals are perceived as happy and satisfied and tend to be liked by others (McAdams, 1992; Weinberger et al., 2010).

Differentiation between Implicit and Explicit Motives

For a long time, it has been commonly assumed that self-attributed and unconscious motives are basically the same, and thus, can be equally assessed with direct (e.g., questionnaires) and indirect measures (e.g., projective measures such as the PSE; e.g., Campbell & Fiske, 1959; Raven, 1988; Sherwood, 1966). Most researchers decided to use questionnaires because they appeared to measure motives more reliably and with less effort (McClelland et al., 1989; Schultheiss & Brunstein, 2010). However, over time it became more and more apparent that both measures correlate rarely significantly with each other (see for an early meta-analytical evidence: Spangler, 1992). Thus, McClelland and his colleagues (1989) assumed that direct (questionnaires) and indirect (PSE) measures capture different aspects of the personality. They suggested to differentiate between both measures and their underlying

constructs and termed one construct implicit motives and the other construct self-attributed or explicit motives (McClelland et al., 1989).

Self-attributed or explicit motives are obtained by directly asking individuals in questionnaires about their wishes, goals, and motivated behaviors. A well-known example for such self-attributed motives are individual life goals (e.g., "I want to spend a lot of time with others"). They are defined as consciously and cognitively accessible representations of "desired states that people seek to obtain, maintain, or avoid" (Emmons, 1996, p. 314). These goals operate on an abstract and higher-order level. Thus, they act as superordinate goals for lower order goals (Austin & Vancouver, 1996). However, indirect measurements, such as the TAT (Morgan & Murray, 1935), or the PSE (McClelland et al., 1989), assess implicit motives that are not accessible by introspection and consequently, by direct self-reports. Implicit motives are also termed unconscious motives or needs.

Nowadays, it is empirically proven and established that implicit and explicit motives are different constructs that correlate with each other only to a limited amount (see for a recent meta-analysis: Köllner & Schultheiss, 2014). This might be due to the fact that "people do not have conscious access to the strength of their motives as assessed with the PSE and that the motivational needs and goals they ascribe to themselves cannot be interpreted as valid indicators of their underlying motive dispositions" (Schultheiss, 2008, p. 611). Both constructs differ significantly from each other in various ways. Implicit and explicit motives predict different types of behavior and respond to different types of cues (Schultheiss, 2008). Implicit motives predict specific performance measures (e.g., arithmetic task performance; Biernat, 1989), whereas explicit motives predict choices and judgements (e.g., the verbal statement of participants to be a group-leader; Biernat, 1989; Schultheiss, 2008). Besides, implicit motives are mainly activated through operant and nonverbal cues (e.g., nonverbal facial expressions of others; Schultheiss & Hale, 2007), whereas explicit motives are activated through verbal cues (Schultheiss, 2008). Furthermore, implicit motives presumably develop through prelingual, affective learning experiences in childhood (McClelland et al., 1989). In contrast, explicit motives and goals evolve from the confrontation with formal and informal norms as well as regulations in the society and in the family (McClelland, 1985; McClelland et al., 1989). Thus, they are conscious self-attributions that are a part of the individual self-concept (Brandstätter, Schüler, Puca, & Lozo, 2013; McClelland et al., 1989).

However, explicit and implicit motives interact with each other and control the human perception and behavior likewise. Explicit motives constitute and select goals with respect to

specific social standards and direct the behavior, whereas implicit motives provide energy and drive the behavior (Heckhausen & Heckhausen, 2010; McClelland et al., 1989). As implicit and explicit motives are different systems, they can emerge with different intensity and, thus, interact either in a harmonious or in a conflicting way. A high similarity of implicit and explicit motives is termed motive-goal congruence (Brunstein, Schultheiss, & Grässman, 1998). Various studies provided evidence that a high congruence is related to positive outcomes, such as life satisfaction, positive affect and mood, and well-being – even across different cultures (e.g., Brunstein et al., 1998; Hofer & Busch, 2013; Hofer, Busch, Bond, Li, & Law, 2010; Hofer & Chasiotis, 2003; Hofer, Chasiotis, & Campos, 2006). In contrast, it is termed motive-goal incongruence if implicit and explicit motives of an individual point in different directions (Emmons, 1997). This "hidden stressor" (Baumann, Kaschel, & Kuhl, 2005) is often related to negative consequences for the individual well-being and health (e.g., depressive symptoms, unhealthy eating behavior; e.g., Hagemeyer, Neberich, Asendorpf, & Neyer, 2013; Job, Oertig, Brandstätter, & Allemand, 2010; Schüler, Job, Fröhlich, & Brandstätter, 2008, 2009; Schultheiss, Jones, Davis, & Kley, 2008).

Origin and Development of Implicit Motives

Implicit motives exist in all human beings but their strength may differ in different individuals. Researchers assume that implicit motives are partially innate and trace the individual differences back to prelingual learning processes in early childhood that primarily result from specific parenting behavior (McClelland, 1985; Weinberger & McClelland, 1990). Presumably, these learning processes emerge according to processes similar to operant conditioning (e.g., Skinner, 1963). The expression of specific behaviors is reinforced or reduced by positive or negative consequences following the respective behavior. For example, if a child reacts on specific cues in the environment (e.g., masters a challenge) and thereby experiences positive consequences (e.g., reward by the parents), the positive affect of the child increases. Subsequently, the child is going to show the same behavior again to re-experience the positive affect. After a while and several pairings, this behavior is internalized and has become a fixed component of the personality. To date, is has not been finally clarified at which developmental stage these learning processes occur and at which age they stop working. Researchers assume that they emerge either in the early childhood from birth (McClelland, 1985), from the age of one year (Veroff, 1959), or even after the age of three years (Heckhausen, 1967) and then internalize in strong and stable motive dispositions that hardly change later in life (McClelland, 1942; McClelland et al., 1989; Weinberger

& McClelland, 1990). However, these assumptions are only based on theoretical considerations and are very difficult to prove in empirical research.

Unfortunately, there is only limited research on developmental processes of implicit motives and their underlying learning processes caused by parenting behavior (e.g., McClelland & Pilon, 1983; Rosen & D'Andrade, 1959; Winterbottom, 1958). The few existing studies show that parents of high-achievement motivated children are more likely to reward them for mastering difficult developmental steps (e.g., toilet training), to set their demands slightly higher than already feasible for their children, and are more likely to punish them if they cannot master challenging tasks by themselves (McClelland & Pilon, 1983; Rosen & D'Andrade, 1959; Winterbottom, 1958). Researchers assume that parental permissiveness for aggressive and sexual behavior is the cause for a high implicit power motive (McClelland & Pilon, 1983). Even the socialized implicit power motive might be rooted in childhood. Presumably, children who grow up with younger siblings transform their implicit power motive to a more socialized and responsible form of this motive (Winter, 1988). Further, it has been shown that a socialized power motive develops if the father is strongly involved in parenting (McClelland, 1987; McClelland & Pilon, 1983). Regarding the developmental origins of the implicit affiliation motive, the results are inconclusive. Researchers assume that children develop a high implicit need for affiliation if their parents use praise as a socialization technique and if they react less responsible on the crying of their children (Lundy & Potts, 1987; McClelland & Pilon, 1983). The latter might be the reason for the development of the strong social anxiety and fear of rejection that is, as above mentioned, a facet of the implicit affiliation motive.

Stability of Implicit Motives

There is only a limited amount of studies that have investigated the stability and changeability of implicit motives over the lifespan and according to situational influences. Indeed, some researchers assume that implicit motives are consolidated in early childhood and, thus, remain largely stable and long-term personality dispositions (e.g., McClelland, 1942; McClelland et al., 1989; Weinberger & McClelland, 1990). However, this is mainly a theoretical assumption that remained empirically unproven and that does not appears to apply for all contexts. Sometimes, the assumptions about the stability of implicit motives are very inconsistent. For example, McClelland (1942) first stated that implicit motives are stable personality dispositions but acknowledged later that implicit motives can “be formed at any time in life” (McClelland, 1958, p. 452).

Some studies report a moderate stability of implicit motives according to longitudinal reliability analyses. There is meta-analytical evidence that the reliability coefficient steadily decreases from .71 (retest interval of one day) to .25 (retest interval of ten years; Schultheiss & Pang, 2007). This finding indicates that implicit motives can be reliably assessed and are stable in the short-term, but might change in the long-term. Research identified a number of sources that might influence the implicit motive scores equally or in specific combinations. First, there might be influences of situational differences and cues on the measurement of implicit motives (e.g., Haber & Alpert, 1958; Morgan, 1953; Winter & Stewart, 1977) and the fantasy production (e.g., McClelland et al., 1972; McClelland & Winter, 1969; Wiemers, Schultheiss, & Wolf, 2015; Wirth & Schultheiss, 2006). Apart from these specific "measurement errors" and "carry-over effects", researchers assume that implicit motives change according to affective learning processes caused by an increased arousal of implicit motives (e.g., McClelland & Kirshnit, 1988; McClelland & Winter, 1969; Valero, Nikitin, & Freund, 2014), training of implicit motives (e.g., McClelland & Winter, 1969), age effects according to specific transitions (e.g., McClelland, Scioli, & Weaver, 1998; Salili, 1996; Veroff, Atkinson, Feld, & Gurin, 1960; Veroff, Depner, Kulka, & Douvan, 1980; Veroff, Reuman, & Feld, 1984), cognitive changes (e.g., Thielgen, Krumm, Rauschenbach, & Hertel, 2015; Valero et al., 2014), and maturation (e.g., Denzinger, Backes, Job, & Brandstätter, 2016). To sum up, research provided some evidence that implicit motives adapt to specific life circumstances. However, this is an area of research that needs further and more systematic research.

Nonverbal Outcomes of Implicit Motives

Researchers conclude that implicit motives are primarily activated through nonverbal cues of the environment and, thus, also manifest mainly on a nonverbal level (for an overview see: Schultheiss, 2008). For example, studies documented that individuals who are high in the implicit intimacy motive showed more interpersonal behavior such as physical proximity to dialog partners, smiling, laughing, and eye contact in conversations (McAdams, Jackson, & Kirshnit, 1984), whereas individuals high in the socialized need for power showed more verbal fluency, gestures and eyebrow lifts (Schultheiss & Brunstein, 2002). Besides, research provides initial evidence that implicit motives not only influence the direct nonverbal communication (e.g., gesturing), but also the coordination of movements in an interpersonal interaction (e.g., LaFrance & Ickes, 1981; Lakin & Chartrand, 2003; Miles, Lumsden, Richardson, & Neil Macrae, 2011; Stel et al., 2010). For example, Lakin and Chartrand

(2003) assumed that a high need for affiliation results in a better coordination of movements with an interaction partner. Presumably, this coordination is unconsciously utilized to satisfy the need for affiliation. In sum, research evidences that implicit motives are mainly expressed through nonverbal behavior. Presumably, individuals unconsciously utilize this form of communication to deliver their needs to whom they are speaking and even to satisfy their needs.

Implicit Motives in Intimate Relationships

Intimate relationships can be considered and highlighted as specific life circumstances. They exert enormous influence on all involved individuals because these individuals spend a large part of their lives in this domain. Thus, an intimate relationship might also influence the individual implicit motive disposition. This might happen through the intensive personal contact and the interaction with a significant other, such as the partner. The better acquainted partners are with each other, the more similar they become in their way of living (e.g., similar leisure activities; Gere & Schimmack, 2013). Thus, partners increasingly gain shared experiences (Hoppmann & Gerstorf, 2009), and become more and more similar regarding their affective responses (Anderson, Keltner, & John, 2003) and affective experiences (Gonzaga, Carter, & Buckwalter, 2010). As already noted, implicit motives develop through affective learning experiences and are activated through affective incentives (e.g., McClelland, 1985; Schultheiss, 2008). Therefore, it seems fairly plausible that implicit motives might likewise change through the influence of a partner if, after some time of acquaintance, other behaviors are perceived as affectively rewarding (e.g., doing sports together, cuddling up in the evening).

Intimate relationships provide a framework to express basic needs and to attain specific goals (Cantor & Malley, 1991). Interactions can be seen as a motivated and goal oriented behavior (Horowitz et al., 2006). Thus, motivational variables, such as implicit motives and goals, directly influence spouses' interaction. They, mostly automatically, control the perception and interpretation of events (Cantor & Malley, 1991). The higher level motivational dispositions (e.g., implicit motives) exert influence on the behavior of partners in the relationship because they automatically and unconsciously activate specific action plans and behavioral strategies for goal attainment and need fulfillment (Aarts & Dijksterhuis, 2000). There is already empirical evidence that documents the importance of implicit motives in intimate relationships. Research shows that implicit motives influence variables that are important for the formation and maintenance of intimate relationships such as relationship

satisfaction, separation, sexuality, and parenting (e.g., Hagemeyer et al., 2013; Hagemeyer & Neyer, 2012; Job, Bernecker, & Dweck, 2012; Mason & Blankenship, 1987; Schultheiss, Dargel, & Rohde, 2003a; Stewart & Rubin, 1976; Winter, Stewart, & McClelland, 1977). In sum, intimate relationships might influence the individual motive dispositions of the particular partners. Additionally, implicit motives also exert a significant influence on the intimate relationship.

Present Research

The present research examines a traditional assumption about the stability of implicit motives that is still present in modern motivational research. It seems to be common ground that implicit motives are acquired through affective experiences in early childhood (e.g., McClelland, 1985; Schultheiss, 2008; Schultheiss & Brunstein, 2010). Researchers often assume, implicitly or explicitly, that implicit motives will remain relatively stable afterwards (e.g., McClelland et al., 1989). Often, this stability-assumption of implicit motives is undisputed, although it is already known that other characteristics of the personality (e.g., the big five) change over the course of life (e.g., Roberts et al., 2006; Specht et al., 2011). However, a careful analysis of the literature on implicit motives reveals several studies that did not support the assumption of motive' stability. Even empirical research provides some evidence against this assumption (e.g., McClelland, 1958; Veroff et al., 1984). So, this thesis reconsiders the assumption that implicit motives are stable over the course of life and investigates determinants that might cause changes in implicit motives.

The structure of this thesis follows a deductive approach: From a general literature review on stability and change in implicit motives, followed by the investigation of influencing factors on implicit motives (age and relationships), and at last the examination of specific consequences of these changes on behavior. The order of the presented articles is based on theoretical assumptions, it does not correspond to the chronological order in which the research was conducted.

Part I: A Literature Review of Empirical Studies on the Stability and Changeability of Implicit Motives

As already mentioned, it seems to be a firmly established assumption that implicit motive are stable personality characteristics. Up to now, this assumption as well as determinants that might influence individual implicit motive dispositions were never systematically investigated. However, the knowledge of existing literature on this issue and about potentially influencing factors might be crucial for the general understanding of implicit

motives, their antecedents, and their developmental conditions. Thus, we reviewed and summarized existing literature and corresponding empirical findings on this issue as a useful and broad introduction to this topic. The review includes published studies that are based on three different study designs in order to get the most comprehensive overview of this topic. First, we considered studies that manipulated implicit motives through experimental arousal. We reviewed only studies that reported implicit motive scores of a pre- and a post-condition. These studies can document short-term and situational influences of the environment on implicit motives. Second, the review covers studies that analyzed implicit motive scores across different age groups. These studies might give first evidence whether implicit motives adapt to specific life circumstances (e.g., age-related transitions) over the course of life. Third, we included studies that investigated implicit motive scores with repeated measures at intervals of several weeks, months, or years. These studies can reliably document influences on implicit motive scores according to their usage of methodologically rigid, longitudinal designs.

Each of the above mentioned study designs has its methodological limitations, but also specific advantages. Combining these different designs can yield a comprehensive overview of factors that influence implicit motive scores and a reliable confirmation that implicit motive might actually change according to these factors.

Part II: Age and Gender Differences in Implicit Motives

Age is one big factor that might influence implicit motive scores. As individuals get older, their life is generally characterized by various changes. For example, these changes might involve specific life circumstances, such as changing constellations in family (e.g., birth or death), or career and job situations (e.g., retirement). Additionally, individuals undergo some changes in their regulation of affects (Röcke & Brose, 2013; Scheibe & Carstensen, 2010), and in their hormonal balance (e.g., menopause; Conrad & Bimonte-Nelson, 2010; Ferrini & Barrett-Connor, 1998) with increasing age. In this part, we investigated the change of implicit motives according to a specific and omnipresent cause, namely age-related changes. This research is based on the assumption that implicit motives are strongly related to affects (e.g., Job et al., 2012; Job & Brandstätter, 2009; Schultheiss & Brunstein, 1999) and endocrinological responses (e.g., Schultheiss, 2013). We hypothesized that age-related changes in the affective responsiveness and in hormonal levels can cause decrements in implicit motives.

Research repeatedly evidenced that older adults react less strongly to affective situations and incentives than younger adults because they probably strive for emotional stability (for an overview see: Röcke & Brose, 2013; Scheibe & Carstensen, 2010). There are many reasons for this: For example, older adults are experienced in dealing with emotions, thus, they have a high emotional stability that is further supported by a stable environment. Besides, older adults have to optimize their emotion regulation according to an increase in unpleasant events over the course of life (e.g., health impairments, death of significant others). Finally, a more consolidated self-concept protects older adults from short-term variations in affective responses. According to the above mentioned reasons for the lowered affective responsiveness, we assumed that older adults do not show strong affective responses to the picture cues that should arouse implicit motives. As a consequence of this lowered affective responsiveness, fewer motive-relevant content emerges in the stories written to these picture cues.

In addition, researchers assume that specific hormones (e.g., testosterone, dopamine) support the satisfaction of implicit motives and reinforce the learning of behavior that satisfies implicit motives (Schultheiss & Rohde, 2002). Besides, hormones affect motivational functions such as the response to conditioned cues (this can be equated with the arousal of implicit motives; Schultheiss, 2013). There is already research that shows an age-related decline in hormonal levels (e.g., Ferrini & Barrett-Connor, 1998), in the individual sensitivity to specific hormones (e.g., Conrad & Bimonte-Nelson, 2010), as well as an age-related impairment in brain structures that are responsible for processing hormones (e.g., Ferrari et al., 2001). We assumed that the mentioned age-related changes in the hormonal system influence the procession of affective signals and affective responses in motive-related situations causing a general decrease in the level of implicit motives as individuals get older. Furthermore, we descriptively investigated gender differences in implicit motives and also age differences in activity inhibition, which is a measure of impulse control and an indicator of right-hemispheric laterality (McClelland et al., 1972; Schultheiss, Riebel, & Jones, 2009).

Part III: Influences of an Intimate Relationship on Implicit Motives

Intimate relationships are a further, more specific, factor that might cause a change in the individual implicit motive disposition. The influence of intimate relationships should be emphasized as an important factor in the research on possible influencing factors because humans spend a large part of their lives in intimate relationships with another individual. This time is often characterized by a strong togetherness. Thus, individuals are influenced in the

long-term by another, very important, and highly valued person. Similar to the long-term influence of parents on the individual motive disposition of their children (e.g., McClelland & Pilon, 1983), romantic partners might also influence each other's implicit motive disposition. In this part, we investigated if spouses influence each other and become increasingly similar to each other regarding their motivational dispositions over the course of their relationship. Besides, we took into account if individuals choose a partner who is already similar to them in their motivational dispositions at the beginning of the relationship. For this research, we considered the implicit motives in the domains of achievement, power, affiliation, and intimacy, as well as conscious life goals in the same domains.

We hypothesized that partners choose each other only according to a similarity in life goals but not in implicit motives. This assumption is primarily based on the visibility or invisibility of implicit motives and life goals. Life goals are defined as conscious and cognitive accessible parts of the self-concept that are very important for the individual way of living and even for the cohabitation with others (e.g., Fitzsimons, Finkel, & vanDellen, 2015). Research provided evidence that these goals can be recognized by interaction partners and that they are even communicated in interactions (for example in the initial phase of getting to know each other; e.g., Jackson, 1974; McClelland, 1972a; McClelland et al., 1989). Thus, individuals can choose a partner according to a high similarity in life goals. In contrast, implicit motives are unconscious characteristics of the personality that are mostly not even discernible by introspection (McClelland, 1985). Therefore, implicit motives might become only visible to the partner through specific behaviors (e.g., preference for competitive sports) when they get better acquainted with each other, but not at the beginning of a relationship.

Further, we hypothesized that partners become increasingly similar to each other in their implicit motive dispositions but not in their life goals. We assumed that the similarity of spouses in their life goals is very high at the beginning of their relationship and, thus, the similarity does not increase any further over the course of the relationship. However, we hypothesized that spouses become increasingly similar to each other in their implicit motive disposition when they get better acquainted with each other. This is based on the theoretical assumption that implicit motives develop through affective learning experiences (McClelland, 1985). Research evidenced that spouses become more and more similar to each other in their experiences and activities (e.g., Gere & Schimmack, 2013; Hoppmann & Gerstorf, 2009), as well as in specific affective experiences (Gonzaga et al., 2010), and affective responses (Anderson et al., 2003). It is conceivable that spouses' changed affective experiences, which

are known as the root of implicit motives, result in a steady adaption of implicit motives with increasingly shared experiences over the course of a relationship.

Part IV: Behavioral Outcomes of High Similarity in Implicit Motives

The preceding part covered the issue of an increasing spousal similarity in implicit motives when both partners become better acquainted with each other. In this part, we investigate concrete consequences of partners' similarity in the implicit intimacy motive on partners' communication in the relationship. Researchers assume that implicit motives mainly emerge through behavior on the nonverbal level of a communication (e.g., Schultheiss, 2008). For example, a high implicit intimacy motive is associated to interpersonal nonverbal behavior, such as physical proximity to interlocutors (McAdams & Powers, 1981), and eye contact (McAdams, Jackson et al., 1984). Further, empirical studies indicate that individuals who have a high desire to affiliate (e.g., high intimacy-motivated individuals) unconsciously utilize the coordination of movements to satisfy this need and to establish intimacy in interactions (e.g., Lakin & Chartrand, 2003). Thus, we hypothesized that the mutual coordination of movements in partners' communication should be high when both partners have a high need for intimacy. Likewise, it should also be high, if only one partner has a high need for intimacy. We assumed that this partner adapts his or her nonverbal behavior to the behavior of the partner to compensate the missing match in their motivational dispositions for intimacy and to establish intimacy in the conversation. Further, we assumed a reduced coordination of movements, if both partners have a low need for intimacy. We used nonverbal synchrony as a measure of movement coordination. This measure indicates the communication partners' congruence in terms of rhythm and coordination of behavior in interpersonal communication situations (Condon & Ogston, 1971). It has the advantage that it captures an unconscious and uncontrollable facet of the nonverbal communication of both partners. In addition to body movements, it measures dynamic components of nonverbal communication, that is, global and quantitative elements, such as speed, duration and complexity of movements (Ramseyer & Tschacher, 2006).

We also examined the association between the above mentioned variables and the quality of the relationship. We assumed that a high nonverbal synchrony is positively related to relationship quality of the partners, measured by variables such as relationship satisfaction and commitment to the relationship. Referring back to the major topic of changeability of implicit motives, this part highlights the high level of applicability and the importance of changed implicit motive scores for interpersonal processes such as the communication in

intimate relationships and their consequences on substantial variables such as relationship quality.

After presenting the four different research articles, their findings in general as well as limitations and implications of the present thesis will be discussed.

Part I:

A Literature Review of Empirical Studies on the Stability and Changeability of Implicit Motives

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Abstract

Although growing research evidences that various personality traits change over the course of life, implicit motives are often deemed as stable personality characteristics. Researchers are interested in implicit motives for several decades, but there is still a lack of clarity in the knowledge about stability or changeability of these personality dispositions. Researchers in the domain of personality psychology highlight the importance of environmental factors as an underlying cause of changes in most personality characteristics (e.g., Roberts et al., 2006). This article reviews empirical studies that investigated the influence of environmental factors as well as long-term change and continuity of implicit motives and draws a preliminary conclusion. It considers studies that (a) aroused implicit motives experimentally and assessed implicit motive scores in a pre- and post-condition, that (b) compared implicit motive scores of different age groups, and that (c) analyzed implicit motive scores with longitudinal methods. The reviewed studies support the conclusion that implicit motives are changeable to a certain extent. Specific environmental factors such as life circumstances and transitions might cause a change in implicit motives.

Introduction

"When you're finished changing, you're finished" Benjamin Franklin

As the quote above reveals, our whole life is characterized by different and inevitable changes such as life transitions, critical life events, or age-related psychological and physiological changes. Researchers in the domain of personality psychology have acknowledged that such changes even concern personality characteristics. They concluded that personality traits (e.g., the big five) are not as stable as they have been assumed for a long time. Recent studies have shown that they change over the course of life (for an overview see Roberts et al., 2006; Specht et al., 2011). A meta-analysis that is based on 92 studies on change in personality traits showed significant changes in various personality dispositions, for example, a decrease of openness and an increase in conscientiousness, over the course of life (Roberts et al., 2006). However, such changes do not only affect the big five, but also other personality characteristics such as self-confidence, self-control, and intelligence (e.g., Roberts & Mroczek, 2008; Verhaeghen & Salthouse, 1997). In sum, there is empirical evidence for a changeability of personality characteristics.

It seems likely that such changes over the course of life affect not only the above mentioned personality traits, but also basic motivational orientations such as implicit motives. They can be considered as another core part of the personality (Winter, 1996) that covers a different aspect of it and also predicts different behavior than traits (Winter et al., 1998). Implicit motives are defined as unconscious motivational dispositions that are activated through affectively charged incentives influencing spontaneous behavior (McClelland, 1985; Schultheiss, 2008). Researchers postulate that they are acquired early in the preverbal phase of life through the repeated experience of motive-satisfying incentives (McClelland & Pilon, 1983). Despite the increasing knowledge about the changeability of personality characteristics (e.g., Roberts et al., 2006), implicit motives are often still considered as a stable part of the individual personality that is exclusively formed in the early childhood (McClelland, 1985; McClelland & Pilon, 1983). So far, the stability of implicit motives has been rarely questioned and there is little research on this topic. It is the purpose of this review to document studies that analyze the stability or the changeability of implicit motives and to draw a preliminary conclusion about the stability of implicit motives. In order to attain this objective three different approaches were identified and chosen. First, we review studies that systematically investigated the influence of environmental factors on implicit motives. These studies manipulated implicit motives for example through experimental arousal or through training

and assessed implicit motives in a pre- and post-condition. Such studies are able to document environmental influences and a situational change of implicit motives within a relatively short period of time. Second, we were interested in studies that investigated influences on implicit motive scores independently of experimental manipulations and outside the laboratory. Thus, we took studies into account that analyzed implicit motive scores in different age groups. These studies can show whether implicit motive scores differ between individuals of different ages or not. They might allow conclusions about the influence of environmental factors such as specific life circumstances (e.g., transitions) on implicit motive scores over the course of life. Third, we considered studies that investigated implicit motive scores with repeated measures at intervals of several weeks, months or even years. These studies can reliably document changes in implicit motives through methodological rigid longitudinal designs.

Implicit Motives and their Origins

Implicit Motives: Theoretical Background, Definition, and Measurement

Implicit motives are enduring preferences for "the attainment of specific classes of incentives and the avoidance of specific classes of disincentives" (Schultheiss, 2008, p. 603). Thus, they influence the perception and evaluation of specific situations (Heckhausen, 1977). These motivational dispositions individually orient and energize the behavior toward situations that were already experienced or, at least, anticipated as rewarding (McClelland, 1985). For example, some individuals might experience positive emotions through influencing others in a group discussion, while other individuals might be happy when they meet new friends in the same situation.

Implicit motives are poorly conscious accessible, and, therefore, not assessable through self-reports of personal needs (McClelland et al., 1989). Instead, they are assessed with indirect measures relying on projective techniques that instruct individuals to produce imaginative stories to ambiguous picture stimuli that depict people in different situations (e.g., a couple sitting on a bench by the river or a ship captain talking to another man; Pang, 2010). Projective techniques for the measurement of implicit motives are based on the underlying assumption that ambiguous picture cues arouse specific needs and, thus, elicit a motivational response (McClelland, 1985; Pang, 2010). This response emerges in the content of the written imaginative material and is codable for motive imagery using standardized and validated content coding systems (e.g., McAdams, 1980; Winter, 1991). The most frequently used measure of implicit motives is the Picture Story Exercise (PSE, McClelland et al., 1989; Pang, 2010) that is based on the Thematic Apperception Test (TAT, Morgan & Murray, 1935).

Besides, researchers developed some other motive measurements such as the semi-projective Multi-Motive Grid (MMG, Sokolowski, Schmalt, Langens, & Puca, 2000), the Operant Motive Test (OMT, Kuhl, Scheffer, & Eichstaedt, 2003), the Partner-Related Agency and Communion Test (PACT, Hagemeyer & Neyer, 2012), or an adapted version of the Implicit Associations Test (IAT, Brunstein & Schmitt, 2004).

The "Big Three"

Since the 1950s researchers are interested in the "big three" of implicit motives. McClelland (1985) called them the need for Achievement (nAch), the need for Power (nPow) and the need for Affiliation (nAch). The achievement motive is the need to accomplish something difficult in competition with a high and challenging standard of excellence. The power motive is the need for the experience to have impact on others. The affiliation motive is the need to establish and maintain positive relationships with others (McClelland, 1985; Schultheiss, 2008). Implicit motives in these three different domains represent a capacity to derive satisfaction from the attainment of the above mentioned domain specific incentives (e.g., mastering a challenge; Schultheiss, 2008). Research documented in a multitude of studies that implicit motives are a good predictor of individual behavior in all motive domains, and, subsequently, highlighted the importance of implicit motives for individual's life (e.g., Biernat, 1989; Brunstein & Hoyer, 2002; deCharms et al., 1955; Hagemeyer et al., 2016; Jenkins, 1994; McAdams & Constantian, 1983; McClelland, 1961, 1965, 1987; McClelland & Boyatzis, 1982; Schultheiss & Brunstein, 2002).

However, implicit motives are not only related to the individual behavior, but also to psychophysiological responses such as the release of hormones (implicit power motive: testosterone and estradiol; implicit achievement motive: cortisol; implicit affiliation motive: dopamine and progesterone; McClelland et al., 1987; Schultheiss, 2013; Schultheiss et al., 2014; Schultheiss & Rohde, 2002; Yang et al., 2015). In addition, implicit motives are associated with specific health outcomes such as stress, changed blood pressure and health parameters (Baumann et al., 2005; Brandstätter, Job, & Schulze, 2016; Job et al., 2010; McClelland, 1989; Schüler et al., 2009). In sum, implicit motives are an integral part of the human being. They influence individual behavior and are strongly linked to various psychological and physiological processes.

Origins and Development of Implicit Motives

Implicit motives exist in all human beings, but are pronounced in each individual to a different degree. Researchers conclude that implicit motives are innate and that individual differences are mainly attributable to early (prelinguistic) learning experiences (Weinberger & McClelland, 1990, p. 581). McClelland (1985) argues that implicit motives are automatic impulses triggered by environmental variables (e.g., seeing another person) to act in a specific way (e.g., seeking contact) that enhances the likelihood of pleasurable affective experiences (e.g., feeling accepted). He termed these experiences the "natural incentives" (McClelland, 1985, p. 136).

The presence and the experience of these natural incentives might serve as a precondition to the above mentioned early learning processes of implicit motives. The McClelland (1985) model assumes that individual differences in implicit motives emerge according to early learning processes similar to operant conditioning. The occurrence of specific behaviors is reinforced or reduced by positive or negative consequences of the respective behavior. For example, if an individual responds to specific cues in the environment (e.g., a challenge) and experiences positive consequences of this behavior (e.g., reward by the parents for overcoming the challenge), the pleasurable feelings of the individual increase. Subsequently, the individual will later behave in a similar manner to re-experience the positive affect. This behavior and the striving for these specific satisfying incentives will be consolidated through a frequent repetition of the above mentioned process (McClelland, 1985). To date it has not been finally clarified at which developmental stage these learning processes occur and at which age they stop working. Some researchers argue that these processes already take place from the early preverbal neonatal phase (McClelland, 1985), while others argue that developmental processes happen from the age of one (Veroff, 1959), or even from the age of three (Heckhausen, 1967).

Researchers assume that these learning processes result from specific parental child-rearing practices (McClelland et al., 1989; McClelland & Pilon, 1983). First empirical evidence was documented by a few studies that investigated the relationship between specific parenting practices in childhood and implicit motive dispositions in adulthood (e.g., McClelland & Pilon, 1983; Rosen, 1962; Rosen & D'Andrade, 1959;Winterbottom, 1958). For example, McClelland and Pilon (1983) did a follow-up study on children whose mothers were interviewed on their child rearing practices when their children were five years old. The researchers contacted these children more than 25 years later and assessed their implicit

motives. They found that a severe toilet training and scheduled feeding in childhood was linked to a high implicit achievement motive. Presumably, this is caused by a strong focus on mastery and independence in parental child rearing practices. They also found that maternal permissiveness about aggressive and sexual impulses in the first years of life was linked to a high implicit power motive. Data regarding the implicit affiliation motive was less clear. Seemingly, children who experienced insecurity in their early affiliative relationships (e.g., mothers do not react on children's crying) developed a strong fear of rejection, which is a facet of a high implicit affiliation motive (McClelland & Pilon, 1983). To sum up, specific child rearing practices might offer children the possibility to experience specific natural incentives (e.g., mastering a challenge or influencing others) as rewarding. The repeated execution of behaviors to gain specific reward reinforces the respective motive disposition.

Researchers argue that these affective learning experiences consolidate a strong and stable motive disposition exclusively in the early childhood (McClelland et al., 1989) and that specific experiences in later phases of life do not necessarily influence the implicit motive disposition (McClelland, 1942; Weinberger & McClelland, 1990). However, this is basically a theoretical assumption. The learning process of implicit motives, which is comparable to an operant conditioning approach, could also occur during school-age and even adulthood. It is theoretically possible that implicit motives are acquired and even changed later in life through comparable affective experiences and learning processes (McClelland, 1958; Duncan & Peterson, 2010; McClelland et al., 1989; McClelland & Pilon, 1983). It is conceivable that environmental influences, such as specific changes in the individual life (e.g., transitions, critical life events) trigger affective learning experiences. Researchers in the field of personality psychology already revealed the important role of the environment (in addition to maturation according to temperament or genetic factors) as a major underlying cause of change in most personality characteristics (e.g., Anusic & Schimmack, 2016; Hudson & Fraley, 2015; Kogan, 1990; Roberts et al., 2006; Specht et al., 2011). They assume, for example, that individual experiences in (new) social roles (e.g., parenthood) and associated role expectations by others influence the individual personality disposition through processes similar to the above mentioned operant conditioning (e.g., through repeated punishment, reward, or social reinforcement of expected behavioral and affective patterns; Hudson & Fraley, 2015; Roberts et al., 2006; Specht et al., 2011). However, not only expectations about social roles are deemed to influence personality characteristics, but also normative changes and major life events (Specht et al., 2011). In general, "changing circumstances can contribute to changes in personality" (Anusic & Schimmack, 2016, p. 774).

Hence, environmental influences should also be considered as an important factor that might be responsible for changes in the individual implicit motive disposition. We will therefore initially review experimental studies that systematically examine the influence of environmental stimuli on implicit motives. These are studies that investigate, for example, specific (experimental) arousal conditions of implicit motives or examine intervention programs on the trainability of these personality characteristics (e.g., systematic long-term arousal of implicit motives). Such studies can provide first evidence that implicit motives might also belong to the above mentioned category of personality characteristics that are susceptible to the influence of environmental factors. In a second step, we review studies that investigate stability and change of implicit motives in the "real world" over the course of life. These are studies that compare implicit motive scores across different age groups or even analyze them in a longitudinal way.

It will be the purpose of this article to review such studies and to draw first conclusions about the stability and changeability of implicit motives. The incorporation of studies using different methodological approaches (e.g., experimental vs. longitudinal) gives a more holistic view, circumvents methodological problems (e.g., influence of cohort effects) and, thus, allows us to draw a reliable conclusion.

Method

The literature search was conducted through the databases PsychINFO, PsychARTICLES, PsychBOOKS, PSYNDEX, and the search engine Google Scholar using the following keywords in various combinations: implicit motives, change, stability, retest, training, age differences, reliability, PSE, TAT, development, life span, and longitudinal. Neither publication dates, nor geographical location of studies were restricted. Further, we used the ancestry approach and screened the references of all located articles for additional studies. To answer our research question, we included only studies that conform to the following criteria: First, implicit motives (achievement, power, affiliation) must be assessed with the most frequently used measures, namely the Thematic Apperception Test (TAT) and the Picture Story Exercise (PSE)[1]. Second, implicit motives must be analyzed with common and standardized coding rules (e.g., Winter's *(1994) Manual for scoring motive imagery in running Text*). Third, studies must be published in scientific journals or books. Fourth, studies

[1] We considered only studies for this review that assessed implicit motives through the TAT or the PSE because the motive scores assessed with different measures (e.g., PSE, MMG, OMT) are only weakly related to each other (Schüler, Brandstätter, Wegner, and Baumann, 2015). Thus, it was necessary to exclude studies that used other measurements than the TAT or PSE to ensure comparability.

must match the following types of studies: (a) Experimental studies that investigated changes in implicit motives that are due to specific situational arousal conditions and that assessed implicit motive scores in a pre- and post-condition. Studies that (b) compared implicit motive scores of different age groups, or (c) analyzed implicit motive scores with longitudinal designs over the course of several weeks, months, or years. In total[2], we selected 36 studies that comply with our criteria for this review. We summarize these studies according to the above mentioned procedure in the following section.

Results

This review is structured as follows: At the beginning, we focus on studies that investigate the (short-term) influence of environmental factors on implicit motives (e.g., specific experimental arousal conditions). Then, we review studies that analyze implicit motive scores over the course of life (age differences and longitudinal analyses). In detail, first we review studies that manipulated implicit motives and reassessed them afterwards. Second, we summarize studies that compared implicit motive scores of different age groups. Third, we review longitudinal studies that reassessed individual implicit motive scores several weeks, months or years later. In each part, we briefly describe the respective studies and summarize their results, then we report authors' theoretical assumptions about stability and change of implicit motives (e.g., how do they explain the result of a change in the implicit motive pattern?).

Motive Arousal

This first part of the review focuses on the question how environmental stimuli (e.g., specific arousal conditions, systematic exposition to motive thematic content) influence implicit motive scores. How do implicit motives react on these stimuli? This part can provide evidence that implicit motives are basically prone to change according to external influences (at least short-term and situational). It seems important to address this issue at the beginning of this review, because the basic influenceability of implicit motives might be a preceding condition for long-term influences on implicit motives.

Studies in this category have a more or less short-term experimental arousal of implicit motives in common. Whereas some studies activate implicit motives through specific

[2] This review covers not all available empirical studies because, for example, some research articles compared the aroused motive scores to untreated control groups but not to the motive scores before arousal. Thus, they do not fulfill our inclusion criteria (e.g., assessment of implicit motive scores in a pre- and post-condition). Subsequently, such studies are not mentioned in this review.

imagination tasks (e.g., watching motive arousing video material; McClelland & Kirshnit, 1988), or through preceding motive-relevant behavior (e.g., public speaking; Wiemers et al., 2015), some other studies arouse implicit motives through specific exercises in training programs that were explicitly designed to change implicit motives (e.g., McClelland & Winter, 1969). All of the studies that are reported in this category assessed implicit motives in a pre- and a post condition, and were, therefore, able to trace changes in implicit motive scores back to the influence of specific environmental factors. Table 1 gives an overview of the above mentioned studies and their characteristics. We summarize these studies according to their specific arousing conditions (imagination tasks, preceding behavior, training) and describe authors' theoretical assumptions and explanations of these influences on the implicit motive disposition in the following paragraphs.

Table 1

Studies Investigating Situational Change of Implicit Motives

Author(s)	**sample**	**motive**	**experimental manipulation**	**change in motive(s)**
DeCharms (1976)	*N* = 88	Achievement	achievement training in the classroom	Increase in nAch only for boys in the sixth grade
Haber & Alpert (1958)	*N* = 80 college students	Achievement	achievement-oriented instructions and preceding achievement tests	increase in nAch after arousal
McClelland & Kirshnit (1988)	*N* = 132 college students	Power, Affiliation	50 minutes of power or affiliation arousing movie excerpts	increase in nPow and nAff after arousal
McClelland & Winter (1969)	*N* = 49	Achievement, Power	achievement training	Increase in nAch and nPow after training
McClelland, Davis, Kalin, & Wanner (1972)	*N* = 50	Power	alcohol consumption	Drinking tends to increase generalized power concerns
Rawolle, Schultheiss, Strasser & Kehr (2016)	N_1 = 49 college students, N_2 = 50 college students	Achievement	guided motive arousing visualization	increase in nAch after arousal
Schultheiss, Wirth, & Stanton (2004)	*N* = 60 college students	Power, Affiliation	30 minutes of power or affiliation arousing movie excerpts	increase in nPow and nAff after arousal
Valero, Nikitin, & Freund (2014)	*N* = 108; community sample	Power, Affiliation, Achievement	manipulation of the future time perspective	higher motive scores after manipulation (short time perspective)
Wiemers, Schultheiss & Wolf (2015)	*N* = 72	Power, Affiliation, Achievement	induction of psychosocial stress (TSST)	TSST arouses nPow
Wirth & Schultheiss (2006)	*N* = 90 college students	Affiliation	30 minutes of affiliation arousing movie excerpt	effects of arousal on nAff

Note. nAch = implicit achievement motive, nPow = implicit power motive, nAff = implicit affiliation motive.

Motive arousal through imagination tasks. Many researchers aroused implicit motives through specific visualization and imagination tasks. They demonstrated that these environmental cues influence implicit motive scores. For example, researchers presented motive arousing movie excerpts to individuals (e.g., 30 minutes excerpt of the movie "The Godfather II" to arouse implicit power motives; Schultheiss, Wirth, & Stanton, 2004; or 50 minutes excerpt of a movie about the activities of Mother Teresa to arouse implicit affiliation motives; McClelland & Kirshnit, 1988) and documented significant increases in the respective implicit motive scores after individuals watched these movie excerpts (McClelland & Kirshnit, 1988; Schultheiss et al., 2004; Wirth & Schultheiss, 2006). In addition, a recent study investigated the effects of a guided achievement motive arousing visualization on the implicit achievement motive (Rawolle, Schultheiss, Strasser, & Kehr, 2016). In this setting, participants had to close their eyes and should listen to a vividly described achievement-related scenario (e.g., about a graduation ceremony). The authors reported higher achievement motive scores after arousal, too (Rawolle et al., 2016). Valero et al. (2014) also used imagination exercises and presented different scenarios to their subjects to manipulate how they perceive their future time perspective (e.g., imagine that you have only two weeks left before you leave your family and your friends). The researchers found that a perceived shorter time perspective leads to a stronger activation of implicit motives.

How do the researchers explain the effects of these imagination tasks on implicit motives? Some authors assumed that implicit motive scores increase when individuals are exposed to motive relevant content (e.g., Rawolle et al., 2016; Wirth & Schultheiss, 2006). Specific imagination tasks foster motive specific content in fantasies that might lead to higher motive scores in a later assessment (Wirth & Schultheiss, 2006). Researchers argued that specific situations (e.g., motive-domain specific visionary images) elicit picture-like mental representations in individuals' stream of though and, thus, easily get access to the implicit motive system according to their quasi-perceptual format and, thus, elicit motivation (Rawolle et al., 2016). Other authors reasoned in a similar way and stated that specific environmental cues such as movie excerpts might be able to engage motivational and emotional systems (Wirth & Schultheiss, 2006) and induce aroused motivational states (Schultheiss et al., 2004).

Valero et al. (2014) considered a different explanation assuming that implicit motive scores are dependent on cognitive processes. They argued that implicit motive scores should increase if individuals perceive their future time perspective as limited (a process that might also occur when individuals get older), because the short, remaining time leaves only little

room to satisfy implicit motives. They based their argumentation on the assumption that individuals strive for affectively rewarding experiences and that an activation of implicit motives might lead to these experiences. Consequently, specific situations might arouse implicit motives because they are full of cues that give the opportunity for need satisfaction (Schultheiss et al., 2004; Valero et al., 2014).

McClelland and Kirshnit (1988) suggested that specific movie excerpts influence the fight-or-flight response (stress vs. relaxation) dependent on the individual motive disposition. They assumed that a power arousing movie leads to more stress in power oriented people whereas an affiliation arousing movie leads to more relaxation in affiliative oriented people. This response is linked to the release of specific hormones that, in turn, influences the fantasy production increasing implicit motive scores.

Motive arousal through preceding behavior. Some researchers used specific behavioral tasks to arouse implicit motives. Haber and Alpert (1958) employed specific achievement-oriented instructions for the TAT assessment of the implicit achievement motive (e.g., they instructed participants to do their best and emphasized a testing situation), as well as preceding achievement tests (e.g., an achievement anxiety test) to arouse the implicit achievement motive. They found a significant increase in achievement imagery. Another group of researchers used a stress test that reliably increases the cortisol concentration and, thus, the (power-related) psychosocial stress to arouse implicit motives (Wiemers et al., 2015). They advised their participants to give a talk in front of a severe and reserved committee and videotaped them. They found that this power-related stress test increased the implicit power motive but not the implicit achievement and affiliation motives (Wiemers et al., 2015). McClelland et al. (1972) came to a similar result after investigating the effects of alcohol consumption on the implicit power motive. They found in an experiment that drinking tends to increase generalized power concerns and, in turn, the implicit power motive.

The authors of these studies mentioned different reasons for the arousal effects of implicit motives. Haber and Alpert (1958) supposed that the measurement of implicit motives is sensitive to situational changes and, thus, responsible for changes in implicit motive scores. They thought that the particular fantasy production is dependent on the cues that are related to the measurement. Besides, they suggested that higher implicit motive scores after arousal are simply due to carry-over effects from preceding performance tasks. Wiemers et al. (2015) concluded that specific situations such as speaking in front of the public influence implicit motive scores because the situations themselves serve as incentives for implicit motives. They

assumed that the specific environmental cues increase motive specific content in participants' fantasy. Other authors argued that physiological changes influence the fantasy production and, in turn, the motive scores (McClelland et al., 1972). They assumed that alcohol consumption stimulates the sympathetic nervous system (e.g., release of adrenalin, increased alertness, increased pulse rate, dulled pain) that might cause increased thoughts about power and strength and "make a men feel stronger" (McClelland et al., 1972, p. 282).

Motive arousal through training and exercises. Presumably, the training program of McClelland and Winter (1969) was the first explicit attempt to change individuals' implicit motive disposition in the long run. The studies of McClelland and Winter (1969) and deCharms (1976a) about motivation training investigated effects of specific exercises (e.g., theoretical inputs, self-awareness exercises) on implicit achievement and power motives in the contexts of economic growth (McClelland & Winter, 1969) and motivation in the classroom (deCharms, 1976a). Whereas McClelland and Winter (1969) described an overall increase in implicit achievement and power motives as well as increased economic activity two years after the training, deCharms (1976a) reported an increase in implicit achievement motives only for boys who received the training in the sixth grade, but not for girls and neither for boys and girls who received the training in seventh grade. The authors concluded that these results are due to two reasons: The measurement of girls' achievement motivation was not reliable because the variability of their data seemed to be reduced. Besides, the training in the seventh grade did not stress achievement motivation. However, the authors acknowledged that their findings about training effects were not very strong.

Researchers who investigated effects of implicit motive trainings assumed that implicit motives are changeable to a certain degree. They considered implicit motives as affectively toned associative networks that are shaped and stabilized in childhood as a basic part of the personality (McClelland & Winter, 1969). They concluded that environmental influences and intensive learning experiences (e.g., through a specific training) repeatedly activate these networks and, thus, can increase the accessibility and strength of implicit motives. deCharms (1976b) build his achievement motivation training on his theory of personal causation with the aim to empower people to control their own behavior (to become "Origins"). He assumed that the concept of achievement motives is very similar to his notion of an Origin that might be changed through specific training.

To summarize, researchers were able to arouse implicit motives through specific experimental manipulations of situational conditions (e.g., imagination tasks, preceding

behavior, training). They demonstrated that environmental factors influence implicit motive scores in, at least, two ways: First, situational incentives stimulate the fantasy production that leads to increased implicit motive scores. Second, specific situational cues are experienced as more affectively rewarding and, thus, might situationally arouse implicit motives.

Age Differences

The first part clearly showed that implicit motives are personality characteristics that are in some way susceptible to the influence of environmental factors. Now, we review studies that were interested in the long-lasting change of implicit motives. The studies reported in this section cross-sectionally investigated implicit motive scores of individuals across different age groups. Although these studies did not analyze implicit motive scores with repeated measurements, they might be able to make first conclusions about the stability or changeability of implicit motives over the lifespan because they investigate implicit motive scores of individuals covering a wide age range. These studies focused especially on changed individual life situations and environmental cues over time as explaining factors for changes in implicit motives.

Table 2 gives an overview of studies that investigated the effects of age on implicit motive scores. First, we briefly describe the studies and summarize their results, then we report authors' assumptions and interpretations about age differences in implicit motives.

Table 2

Studies Investigating Age Differences in Implicit Motives

Author(s)	**sample**	**age range**	**motive(s)**	**main results**	**reason for change**
Denzinger, Backes, Job, & Brandstätter (2016)	*N* = 735	20-35 years old, 40-55 years old, 65-80 years old	Power, Affiliation, Intimacy, Achievement	lower scores of all motives in aged adults	age-dependent changes in affective and neuroendocrinological reactivity
McClelland, Scioli, & Weaver (1998)	*N* = 153; community sample	25-40 years old (*n* = 77), 65-87 years old (*n* = 76)	Power, Affiliation, Achievement	lower scores of nAff and nPow in aged adults	changes in work and family patterns
Salili (1996)	*N* = 764 college students	13-55 years old	Achievement	negative correlation between nAch and age	aged individuals have already passed achievement relevant stages (change in life circumstances)
Schultheiss & Brunstein (2001)	*N* = 428 college students	18-36 years old	Power, Affiliation, Achievement	negative correlation between motive scores (nAff and nPow) and age	no reason described
Thielgen, Krumm, Rauschenbach, & Hertel (2015)	*N* = 201	20-66 years old	Power, Affiliation, Achievement	no significant correlation between motive scores and age	decreasing future time perspective increases perceived importance of social relations
Valero, Nikitin, & Freund (2014)	*N* = 108; community sample	18-32 years old (*n* = 53), 54-86 years old (*n* = 55)	Power, Affiliation, Achievement	higher scores of nAch and nAff in aged adults	the urgency to satisfy implicit motives is increased, when the future time perspective is perceived as limited
Veroff, Atkinson, Feld, & Gurin (1960)	*N* = 1619	21-34; 35-34; 55+	Power, Affiliation, Achievement	lower scores of nAch in aged adults; lower scores of nAff in aged women; higher scores of hope for power for men at midlife	generation differences and different stages of the individual life cycle
Veroff, Depner, Kulka, & Douvan (1980)	1957: *N* = 1369; 1976: *N* = 1040	21-34; 35-54; 55+	Power, Affiliation, Achievement	lower scores of nAff in aged women; higher scores of hope for power for men at midlife	large scale social changes
Veroff, Reuman, & Feld (1984)	1957: *N* = 1363; 1976: *N* = 1208	21-34; 35-54; 55+	Power, Affiliation, Achievement	lower scores of nAch and nAff in aged women; higher scores of hope for power for men at midlife	changes in work and family patterns

Note. nAch = implicit achievement motive, nPow = implicit power motive, nAff = implicit affiliation motive.

Denzinger et al. (2016) cross-sectionally compared the implicit motive scores of $N = 735$ individuals aged from 20 to 80 years and found lower scores of the implicit power, achievement and affiliation motive in older adults compared to younger adults. Another group of researchers investigated implicit motives in two samples representative of the American population and documented significant age differences in the implicit power, achievement and affiliation motive, too (Veroff et al., 1960; Veroff et al., 1980; Veroff et al., 1984). They found lowered scores of the implicit achievement motive in aged adults, lowered scores of the implicit affiliation motive in aged women and a high hope of power for men at midlife. Salili (1996) reported a negative relationship between age and the implicit achievement motive in a study of 764 Chinese students aged 13 to 55 years. Other researchers also documented in a study comparing implicit motive scores of two age groups (young adults, $N = 77$, 25-40 years old; older adults, $N = 76$, 65-87 years old) lowered scores of the implicit power and affiliation motives in older adults compared to younger adults, but not in the implicit achievement motive (McClelland et al., 1998). Schultheiss and Brunstein (2001) were in their study not primarily interested in age differences of implicit motives, but they nevertheless investigated the correlation between age and implicit motive scores of 428 college students aged between 18 years to 36 years. They found a negative correlation between age and the implicit power and affiliation motive, but not between age and the implicit achievement motive. However, there is also a study that did not find significant relationships between age and implicit power, achievement and affiliation motives in $N = 201$ individuals aged from 20 years to 66 years (Thielgen et al., 2015). Another study reported even a positive relationship between age and implicit achievement and affiliation motives, but not between age and the implicit power motive in $N = 108$ individuals ranging from the age of 18 years to the age of 86 years (Valero et al., 2014).

To summarize, the results on age differences in implicit motives appear to be mixed and the direction of change seems to be dependent on the observed samples. One study did not find a significant relationship between age and implicit motive scores (Thielgen et al., 2015), and another study documented a positive relationship between age and implicit motive scores (Valero et al., 2014). However, the majority of studies reported a negative relationship between age and implicit motive scores (Denzinger et al., 2016; McClelland et al., 1998; Salili, 1996; Schultheiss & Brunstein, 2001; Veroff et al., 1960; Veroff et al., 1980; Veroff et al., 1984). Thus, there is evidence for considerable age differences in implicit motives.

How do the authors of the respective studies interpret these results? The majority of the authors assumed that implicit motives might change over the lifespan (see for exceptions: McClelland et al., 1998; Schultheiss & Brunstein, 2001), but researchers had different theoretical views about the direction of change. In general, these findings suggest that something happens during the course of life (e.g., critical life events, role transitions, changed perception, physiological change) that influences implicit motives. Some researchers assumed that implicit motives might change with increasing age according to a change in life circumstances as well as in work and family role commitments (Salili, 1996; Veroff et al., 1960; Veroff et al., 1980; Veroff et al., 1984). These factors might influence implicit motive scores in addition to generational differences in implicit motives (Veroff et al., 1960). It is apparent that the human life is characterized by different stages of life (e.g., childhood, working life, family formation, retirement) that require different competencies, in other words, aligned implicit motives. For example, the entrance into college or working life requires a high implicit achievement motive, whereas the implicit achievement motive becomes less important in retirement (McClelland et al., 1998; Salili, 1996; Veroff et al., 1960; Veroff et al., 1980; Veroff et al., 1984). In addition, critical life events and specific life circumstances might also influence the implicit motive scores (Veroff et al., 1960; Salili, 1996). For example, Veroff et al. (1960) provided evidence that the loss of a spouse causes a decrease in implicit motive scores. They argued that such strong life events might lower the general motivational concern for most individuals and, subsequently, also their implicit motive scores.

Other researchers argued that changes in the individual perception of aging and the future time perspective (Thielgen et al., 2015; Valero et al., 2014), might cause changes in implicit motives as individuals age. Valero et al. (2014) assumed that the future time perspective decreases with advancing age, resulting in an increased urge to satisfy implicit motives and, consequently, in higher implicit motive scores in aged adults. Thielgen et al. (2015) used a similar argumentation in their investigation of age effects on the congruence of implicit motives and explicit goals, although they expected primarily age effects only on explicit goals. The authors argue in accordance with the socioemotional selectivity theory: The perception of a limited future time perspective causes a shift in motivational priorities (Carstensen, 2006). For example, these researchers concluded “that a decreasing future time perspective increases perceived importance of social relations as well as wellbeing through nurturing social contacts” (Thielgen et al., 2015, p. 196). Thus, these researchers assumed that

such activities become increasingly rewarding and, consequently, activate the respective implicit motives (Valero et al., 2014).

Denzinger et al. (2016) considered a different theoretical view: They argued that implicit motive scores are strongly related to affective and neuroendocrinological systems. The authors assumed that individuals undergo some changes in their regulation of affects (e.g., aged adults react less strongly to affective incentives than younger adults because they probably strive for emotional stability) and in their hormonal balance (e.g., menopause) with increasing age. They argue that these changes influence the arousal of implicit motives and are responsible for a general decrease in implicit motive scores.

To summarize, the majority of studies that cross-sectionally investigated age differences in implicit motives found considerable influences on implicit motives according to critical life events, role transitions, changed perceptions, or physiological changes. However, it cannot be ruled out that these results might also be due to specific cohort effects. The studies in the next paragraph take this methodological limitation into account.

Longitudinal Analyses

Studies in this section repeatedly analyzed implicit motive scores within several days (e.g., Winter, 1991) or even decades (e.g., Skolnick, 1966). Therefore, these longitudinal studies seem to be most suitable to proof assumptions about stability or changeability of implicit motives. Table 3 gives an overview of research that longitudinally measured implicit motive scores. These studies generally differ in their research questions because some authors were only interested in the stability coefficients of implicit motive scores whereas others were interested in factors that longitudinally influence implicit motives. Thus, we review in the first part studies that were primarily interested in the retest stability of implicit motives. In the second part, we review studies that explicitly investigated the changeability of implicit motives over time according to specific influencing factors. In each part, we first briefly describe the studies and their results. Then, we summarize how the respective authors explain their findings.

Table 3

Studies Longitudinally Investigating Implicit Motive Scores

Author(s)	**sample**	**measurements**	**interval**	**motive(s)**	**results**	**assumptions**	**comments**
Birney (1959)	*N* = 46 (first), *N* = 40 (second), *N* = 24 (third) male college students	3	4 months, 6 months (October to April)	Achievement	reliability: .29 (4 months), .56 (6 months)	situational influences on motive scores (academic and social concern in different months)	reliability-study
DeCharms (1976)	*N* = 27 - 61	3	1 year	Achievement	reliability: .14 to .46	no assumptions about change without training	reliability-study of control group
Franz (1994)	*N* = 48	2	10 years	Power, Affiliation, Achievement	stability and change: decrease in nAch, increase in nAff, decrease in nPow in men	reduced self-concern and greater concern with communion in the transition to midlife	
Haber & Alpert (1958)	*N* = 26 male college students	2	3 weeks	Achievement	reliability: .54 (corrected: .70)	decrease in implicit motives is due to an adaption to the testing procedure	reliability-study, Study for a refinement of the TAT material, retest after arousal
Heckhausen (1963)	*N* = 42 working students	2	5 weeks	Achievement	reliability: .42 to .59	motives are stable, but differences are due to situational influences on the measurement	reliability study
Jenkins (1987)	*N* = 62 college-educated women	2	14 years	Achievement	increase of nAch for women in highly achievement arousing jobs over 14 years	accumulated occupational experiences in a more or less motive stimulating environment	
Jenkins (1994)	*N* = 62 college-educated women	2	14 years	Power	increase in power (in highly power-arousing jobs e.g., teachers or psychotherapists), decrease in low power arousing jobs.	accumulated occupational experiences in a more or less motive stimulating environment	
Kagan (1959); Kagan & Moss (1959)	*N* = 86 children	3	2,5 - 3 years, in total about 10 years	Achievement	reliability (Phi): .32 (3 years later), .22 (6 years later), increase of achievement themes with age, but also stability over time	tendency to seek achievement goals and influence of the parents	

Kraiger, Hakel & Cornelius (1984)	*N* = 74 college students	2	1 week	Power	reliability: .38 to .52	no assumptions about change of motives	reliability-study, replication of Winter & Steward, 1977
Lundy (1985)	*N* = 42 college students	2	1 year	Intimacy, Affiliation	reliability: .56 (intimacy); .48 (affiliation)	no assumptions about change of motives	reliability-study
Morgan (1953)	*N* = 39-62 male high school students	2	5 weeks	Achievement	reliability: .56 to .64	no assumptions about change of motives	reliability-study
Schultheiss, Dargel, & Rhode (2003)	*N* = 54 (18 normal cycling women, 18 women using oral contraceptives, 18 men)	3	around 10 days	Power, Affiliation	cycle dependent fluctuation of motive scores	cycle dependent hormonal levels increase or decrease the urge to satisfy specific needs	
Schultheiss, Liening, & Schad (2008)	N = 90	2	2 weeks	Power, Affiliation, Achievement	reliability: .37 to .61	participants show substantial stability from one testing occasion to the next	reliability study
Skolnick (1966)	*N* = 93 adolescents	2	20 years	Power, Affiliation, Achievement	reliability: -.11 to .34; Men: stability in nPow (.34), but not nAch and nAff; Women: stability in nAch (.24) and nAff (.21), but not nPow	different roles of women and men are responsible for motive differences	
Winter & Steward (1977)	*N* = 70 college students	2	6 to 8 days	Power	reliability: .61 (same stories are allowed), .27 (different stories)	stability similar to personality traits, small retest-reliabilities are due to test-instructions	reliability-study
Winter (1973)	*N* = 56 (first), *N* = 9 (second)	3	3-18 months	Power	reliability: .29 to .56	TAT responses are affected by situational and contextual cues, but also by learning and change of motives	reliability-study
Winter (1973)	*N* = 110	4	1 year, in total 4 years	Power	reliability: .17 to .30	TAT responses are affected by situational and contextual cues, but also by learning and change of motives	reliability-study
Winter (1991)	*N* = 70 college students	2	6 to 8 days	Power, Affiliation, Achievement	reliability: -.18 to .71	no assumptions about change of motives	reliability-study

Note. nAch = implicit achievement motive, nPow = implicit power motive, nAff = implicit affiliation motive.

Studies that investigated retest-reliability. Many of the studies in Table 3 were primarily interested in methodological questions about reliability issues of the implicit motive measurement. We used the reported reliability scores to draw conclusions about the long-term stability of implicit motives. These studies indicate comparatively sufficient retest-reliability coefficients and, consequently, a certain stability of implicit motives. A recent meta-analysis that included most of the studies mentioned in Table 3 found an average stability coefficient of .71 for a retest interval of one day to .25 for a retest interval of ten years (Schultheiss & Pang, 2007). These stability coefficients change, for example, according to the test instructions (e.g., Lundy, 1985; Winter & Stewart, 1977) and decrease with increasing retest intervals. These results indicate an initial high stability of implicit motive scores, but the decreasing stability coefficients also clearly show that some kind of change occurs over time.

How do the researchers explain and interpret the change of implicit motive scores in their longitudinal studies? Many researchers assumed that implicit motives remain stable over time similar to enduring personality traits (e.g., Haber & Alpert, 1958; Heckhausen, 1963; Morgan, 1953; Schultheiss, Liening, & Schad, 2008; Winter & Stewart, 1977). These authors attributed low stability coefficients to specific measurement problems. They concluded that differences in implicit motive scores over time are due to the use of different test forms (Morgan, 1953), to an adaption of the participants to the testing procedure (Haber & Alpert, 1958), to an implicit demand for novel stories in the second testing (Winter & Stewart, 1977), or to situational influences on the measurement (e.g., authors reasoned that not all situations are equally good opportunities for motive satisfaction; Heckhausen, 1963; Birney, 1959; Schultheiss, Liening et al., 2008). Birney (1959) argued that the implicit motives (e.g., the implicit achievement motive) are highly situational in character and might be influenced over time by a change in academic and social concern. Individuals might be exposed to a high volatility of motive arousing situations (e.g., the achievement motive of students will be aroused more in exam time than in holidays) that might lead to low retest stability coefficients (Birney, 1959). However, Winter (1973) suggested that implicit motive scores do not only change according to different situational and contextual cues influencing the measurement, but also by a change of implicit motives due to learning processes.

Studies that investigated longitudinal influences on implicit motives. Only a few studies were directly concerned with the investigation of longitudinal influences on implicit motives. Jenkins (1987, 1994) investigated the influence of specific employment situations on the implicit motive disposition over time. In detail, she was interested in the change of the

implicit achievement and power motives in women over 14 years according to their employment in specific occupational positions that might be more or less motive arousing. She found that occupations in jobs that stimulate specific implicit motives through their tasks and responsibilities (e.g., professors or teachers) are responsible for increases in these implicit motives 14 years later. Other authors also found significant increases in the implicit achievement motive over ten years according to an achievement stimulating environment (e.g., high maternal concern with children's achievement and high educational level of the parents; Kagan, 1959; Kagan & Moss, 1959). These studies provide some evidence that implicit motives can be learned and strengthened through reinforcement processes in adulthood.

Schultheiss, Dargel, and Rohde (2003b) investigated the influence of hormonal fluctuations during the menstrual cycle on implicit motive scores. The researchers assessed the implicit motives of women at three measurement points corresponding to the menstrual, midcycle, and premenstrual phases of women's menstrual cycle. They found cycle dependent fluctuations in implicit affiliation and power motive scores: the implicit affiliation motive was increased and the implicit power motive was decreased at midcycle (around ovulation phase). This study documents the influence of (situational) changes in gonadal steroid hormones on implicit motives.

Franz (1994) studied the change of implicit motives with a retest interval of ten years and documented a significant increase in the implicit affiliation motive and a decrease in the implicit achievement motive for both, women and men, but a decrease in the implicit power motive only for men. However, she also reported some kind of differential stability in implicit motives: Individuals maintained their relative placement within the group according to their implicit achievement and intimacy motive scores. Skolnick (1966) also reported partial stability of implicit motives within a retest interval of 20 years. She found significant correlations between adolescent (17-18 years old) and adult motive scores (20 years later) in the implicit power motives of men ($r = .34$, $p < .01$), as well as a stability in women's implicit achievement ($r = .24$, $p < .05$) and, to some degree, women's affiliation motives ($r = .21$, $p < .10$).

In the following paragraphs we describe the theoretical assumptions and the interpretations these authors' made in their articles about the stability and changeability of implicit motives. Skolnick (1966) argued that implicit motives are stable characteristics of the personality, but she also assumed that they are only stable over time if they are congruent to

the prevailing sex-roles of the society (e.g., demand for self-assertive characteristics in men). Thus, social roles might cause changes in the individual implicit motive disposition. In addition, other researchers concluded that implicit motives change over time due to learning, age-related changes and normative life experiences (e.g., Franz, 1994; Jenkins, 1987, 1994; Kagan, 1959; Kagan & Moss, 1959; Winter, 1973). For example, Franz (1994) presented three factors that might lead to these changes: maturation or personal development, change in normative reactions to the individual social context, and non-normative change such as stress and critical life events. She argued that changes in implicit motives are due to changes in the individual concern for communion and agency. Individuals in midlife experience a movement toward a greater concern with other people and communion and a reduced self-concern. Higher interiority (e.g., higher responsiveness to inner stimuli, reduced self-assertiveness and reduced striving for challenges; Rosen & Neugarten, 1964) and an adaption to the environment with increasing age might be related to a change in implicit motive dispositions.

However, not only individual developmental processes might be related to changes in implicit motives but also characteristics of the environment and related learning experiences. For example, Jenkins (1987, 1994) argued that a changed life situation (e.g., a specific motive arousing job) is accompanied by factors such as motive gratification and enjoyment that might lead to long term changes in underlying motive dispositions. She assumed that specific life situations (e.g., a high-power job) offer a motive stimulating and reinforcing environment, because daily work life situations provide cues that arouse implicit motives similar to laboratory arousal conditions. Other authors likewise argued in the context of education that reinforced environmental factors and specific demands from the environment influence the implicit motive scores. These researchers suggested that environmental factors such as achievement demands and education of the parents (not only in childhood, but also in adolescence) encourage specific behavioral tendencies (e.g., striving for achievement goals) that, subsequently, influence the implicit motive disposition (Kagan, 1959; Kagan & Moss, 1959).

To summarize, studies that longitudinally investigated individual implicit motive dispositions provided some evidence that changed life situations, environmental and situational factors, learning experiences, and age related developmental processes might influence implicit motives over time. Unfortunately, only a few studies were directly concerned with these influences on implicit motives, but rather with the stability of the

measurement. These studies indicated a certain stability of implicit motive scores according to their acceptable retest-reliability coefficients.

Discussion

The purpose of this article was to review different studies that analyzed stability and change of implicit motives. First, we reviewed studies that investigated the experimental arousal of implicit motives. Most of these experimental studies showed that implicit motives are generally susceptible to influences from the environment. This might be a necessary precondition for a long-term change in implicit motives. In a second step, we addressed the issue of long-term changes in implicit motives and reviewed studies that cross-sectionally and longitudinally investigated the stability and changeability of implicit motives over the course of life. These studies also provided some evidence that implicit motives can change over time. We summarize and discuss the main results of these studies in the following paragraphs.

Motive Arousal

Researchers who investigated (experimental) arousal of implicit motives mainly based their argumentation on the theoretical assumption that individuals strive for affectively rewarding experiences and that specific arousal conditions give the opportunity to satisfy this need (e.g., Schultheiss et al., 2004; Valero et al., 2014). Therefore, the increased arousal heightens the salience of the respective associative network of the implicit motives (e.g., McClelland & Winter, 1969) and the rewarding character of specific cues. This might lead to affective learning effects that increase the implicit motives.

The studies on motive arousal clearly show that arousing cues such as specific movie excerpts, pictures, preceding behavior, or training cause a change in implicit motives that is, at least, short term. However, almost none of these studies made conclusions about long-term changes of implicit motives (see for an exception: McClelland & Winter, 1969). We assumed that these short-term influences might be a necessary precondition for long-term changes in implicit motives. However, it might also be possible that long-term changes in implicit motives emerge without the assumed short-term influenceability. Only the studies on implicit motive training (e.g., McClelland & Winter, 1969) assumed long-term changes and provided evidence for positive behavioral consequences even after several years. Unfortunately, this is no prove of a long-term implicit motive modification because these behavioral changes might also be due to other factors influenced by the training such as improved life management skills (McClelland, 1972b). Other authors even supposed that some achievement motive

training programs did not change the level of the individual implicit achievement motive but its direction from less fear of failure to more hope of success (for an extensive discussion on motivational trainings: Rheinberg & Engeser, 2010).

Many of the studies on motive arousal were not primarily concerned with the investigation of the stability or change of implicit motives. In fact, some authors used differences in implicit motives as a manipulation check (e.g., McClelland & Kirshnit, 1988; Schultheiss et al., 2004; Wirth & Schultheiss, 2006) or were primarily interested in other topics such as the investigation of drinking behavior (McClelland et al., 1972), general motivation training (deCharms, 1976a; McClelland & Winter, 1969), or the mere measurement of implicit motives (Haber & Alpert, 1958). Therefore, some authors made no effort to explain the relationship between arousal and change in implicit motives.

Some researchers assumed that specific situational cues merely stimulate the fantasy production (e.g., McClelland et al., 1972; McClelland & Winter, 1969; Wiemers et al., 2015; Wirth & Schultheiss, 2006). This might also result in heightened implicit motive scores according to a sensitivity of the measurement for changes in imaginative thoughts. In general, it is difficult to distinguish between changes in the individual implicit motive disposition and changes in implicit motive scores that are due to the sensitivity of the motive measurement. In both cases the fantasy production is stimulated resulting in higher implicit motive scores. However, changed imaginative thoughts can cause changes in the implicit motive disposition in the long run if they are, for example, accompanied with respective affective consequences. The studies on motive arousal provide evidence that an important preceding condition of long-term change in implicit motives is given: changed imaginative content. In order to draw more detailed conclusions, it is necessary to analyze these effects in the long run and to consider also studies that measure implicit motives across different age groups and over time.

Age Differences

Researchers who analyzed age differences in implicit motive scores predominantly concluded that changed life situations and transitions (e.g., retirement; e.g., McClelland et al., 1998; Salili, 1996; Veroff et al., 1960; Veroff et al., 1980; Veroff et al., 1984), the personal view on aging (e.g., Thielgen et al., 2015; Valero et al., 2014), and maturation (e.g., Denzinger et al., 2016) might be responsible for some kind of change in implicit motives. Of course, it cannot be ruled out that generational effects are responsible for different strengths of implicit motives in aged adults. Veroff et al. (1960) stated that these cohort effects are a

possible reason for changed implicit motive scores, though, only an additional determinant to the above mentioned.

Besides, it might be possible that age differences influence the measurement of implicit motives. Thus, one might argue that implicit motives are actually stable, because aged adults react in a different way to the measurement. However, this assumption could be applied to nearly every measurement. For example, it has been shown that aged adults respond to a questionnaire in a different way than young adults (e.g., Dijkstra, Smit, & Comijs, 2001; Soubelet & Salthouse, 2011). Thus, an age-related influence on the measurement should always be kept in mind while analyzing aged adults.

Longitudinal Analyses

Some researchers who analyzed implicit motives repeatedly in a longitudinal way concluded that implicit motive scores change according to situational differences in the measurement of implicit motives (e.g., Haber & Alpert, 1958; Morgan, 1953; Winter & Stewart, 1977). However, researchers also assumed that implicit motives change through learning experiences, age-related changes and specific life events (e.g., Franz, 1994; Jenkins, 1987, 1994; Kagan, 1959; Kagan & Moss, 1959; Winter, 1973).

Some studies made only assumptions about the retest-stability of the measurement but not particular about influencing factors on implicit motives over time (e.g., deCharms, 1976a; Kraiger, Hakel, & Cornelius, 1984; Lundy, 1985; Winter, 1991). This review is not directly interested in reliability coefficients[3] but in the inferences from the stability of these scores to the stability of implicit motives. High retest-reliability coefficients might indicate that implicit motives remain stable over time, whereas low coefficients may imply that implicit motives change over time. The above mentioned studies and the meta-analysis of Schultheiss and Pang (2007) documented that the stability coefficient of implicit motive scores decreases with longer retest-intervals. However, this has been reported for personality traits that were assessed via questionnaire, too (e.g., Schuerger, Zarrella, & Hotz, 1989). Thus, one might assume that the stability and the change of implicit motives is very similar to the stability and the change of other personality characteristics.

[3] Interested readers on methodological issues should also draw their attention on articles and reviews that address the reliability of implicit motive measurements (e.g., Entwisle 1972; Schultheiss and Pang, 2007), discussions about these issues (e.g., McClelland 1985; Smith, 1992), as well as determinants (e.g., incentives, priming) on the content of fantasy stories (e.g., Klinger, 1971).

However, the interpretation of retest-coefficients is somehow problematic because these correlations are influenced by random measurement errors that result in an overestimation of change. Besides, these correlations cannot quantify the strength of stability and change because they are dependent on the retest-intervals (e.g., there is a big difference between two weeks and twenty years; Anusic & Schimmack, 2016). Thus, studies that were directly interested in analyzing change of implicit motives over a period of many years (e.g., Franz, 1994; Jenkins, 1987, 1994) appear to be more conclusive.

Stability or Change Over the Course of Life?

Besides a certain degree of hereditability (Weinberger & McClelland, 1990), individual differences in implicit motives are assumed to develop through affective learning experiences (McClelland et al., 1989). The assumption that these learning processes only take place during early, preverbal childhood seems to be untenable. Some researchers on this topic even assume that implicit motives can "be formed at any time in life" (McClelland, 1958, p. 452) and that their strength can change during the course of life according to emotional learning (Schultheiss & Brunstein, 1999). Individuals gain throughout their lives many different experiences that are affectively rewarding, too. There are always new situations that arouse implicit motives. For example, there is even first evidence that a long and stable relationship causes a change in the individual implicit motive disposition (Denzinger, Backes, & Brandstätter, 2017). This research shows that relationship partners converge to each other in their implicit motives with increasing relationship duration. Therefore, it is hardly surprising that affective experiences in life influence the strength of implicit motives.

The objection may be raised that especially childhood is characterized by strong learning experiences and that these affective learning processes decrease in adulthood (for a similar argument see McClelland, 1958). It is conceivable that implicit motives might develop slightly better in childhood than in adulthood because adults often made contradictory affective experiences (e.g., a striving for influence does not lead to well-being but to negative consequences) that cannot be easily unlearned and forgotten and, thus, might complicate the change of implicit motives. Nevertheless, even characteristics that are obviously developed in childhood and that are assumed to be very stable, like the attachment style, show only moderate stability coefficients (e.g., Fraley, 2002) and also a changeability through specific life events (e.g., Hamilton, 2000; Waters, Hamilton, & Weinfield, 2000). Thus, there are indeed situations in life that have the ability to change strong characteristics. Even the assumed hereditability of implicit motives (Weinberger & McClelland, 1990) does not

necessarily mean that implicit motives cannot change during life. There is already evidence that environmental influences can cause a dynamic change of genetic predispositions (for an overview see Dick, Adkins, & Kuo, 2016).

Furthermore, implicit motives are related to many other factors, such as hormones (e.g., Schultheiss, 2013). It might be possible that such elements have impact on implicit motives because these influencing parameters depend on situational and age-related changes. For example, it has been shown that changes in the cycle of women, and, consequently, changes in the hormonal level, influence the strength of implicit motives (Ball et al., 2014; Schultheiss et al., 2003b).

However, there are a lot of open and unanswered questions for future research. For example, it is still unclear how long the change process of implicit motives does exactly take. Is it possible to change the implicit motive disposition through one single critical life event or does it take several years to decades? How strong has the affective learning experience to be? Does it depend on specific predispositions of the individuals such as a high openness for experience or high self-consciousness if implicit motives are susceptible to change? How can the knowledge about life-time change of implicit motives can be used for practical implications such as training programs, psychoeducation, or therapy? In sum, there is a lot of work to be done.

Conclusion

This review shows in a first part that implicit motives are susceptible to short-term influences and that they can be stimulated through specific arousal conditions such imagination tasks, preceding behavior and training exercises. A second part documents that implicit motive scores differ between distinct age groups suggesting age-related influences on implicit motives. Finally, the third part investigates longitudinal influences on implicit motives and reveals some changes in implicit motives over time. Presumably, implicit motives might change to a certain degree when individuals age, go over from one life stage to another, or make specific experiences in their lives. In fact, it is to assume that implicit motives adapt to life circumstances. Their stability and changeability seems to be comparable to other personality characteristics.

Part II:

Age and Gender Differences in Implicit Motives

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Abstract

Research on age differences in implicit motives is rare and has shown contradictory results. We investigated age and gender differences in implicit motives (achievement, power, affiliation and intimacy), measured by the Picture Story Exercise (PSE), in an extensive, heterogeneous dyadic sample of 736 adults aged 20 to 80 years. Data were analyzed with a multilevel approach. Results indicate lower motive scores in all four measured motives in aged as compared to young adults but higher scores in activity inhibition. Further, women scored higher in affiliation and intimacy motives than men, while men scored higher in achievement and power motives and in activity inhibition than women. Possible underlying affective and neuroendocrinological processes of age dependent change in implicit motives are discussed.

Introduction

Implicit motives for achievement, power, affiliation, and intimacy are motivational dispositions that orient and energize behavior outside a person's conscious awareness (McClelland et al., 1989). They are conceived of as individual characteristics that are acquired early during the preverbal phase of life through the repeated experience of motive-satisfying incentives. Accordingly, they were treated as a stable aspect of an individual's personality (McClelland, 1980). So far, only few studies investigated age-dependent differences of implicit motive dispositions across adulthood. The results of these studies were mixed. While some studies have reported higher scores of implicit motives in aged adults (e.g., Valero et al., 2014), others have found lower scores (e.g., Veroff et al., 1984). These inconsistent findings may be ascribed to small sample sizes and differing types of motive measurement.

The present research tests the assumption that implicit motives decrease in old age. We ground this hypothesis on research documenting age-dependent changes in affective and neuroendocrinological reactivity (e.g., Ferrari et al., 2001; Röcke & Brose, 2013). These changes should result in reduced responsiveness to affective motive-specific incentives in their anticipation as well as during enactment. Therefore, we assume that aged as compared to middle aged and young adults reach lower implicit motive scores in all three motive-domains.

Implicit Motives

Since the very beginnings of psychological research, people have been interested in the motivational processes that underlie human behavior. What is important to human beings? What do individuals strive for? To set a research framework to investigate these fundamental questions David McClelland and his colleagues (McClelland et al., 1953) introduced the concept of implicit motives. They defined implicit motives as enduring, mostly unconscious preferences for specific classes of affective incentives (McClelland, 1985; Schultheiss, 2008) and suggested that these motives orient and energize behavior directed to specific activities or affective experiences (McClelland, 1985; McClelland et al., 1989; Schultheiss, 2008).

Three motives have predominantly captured researchers' attention. They have been seen as the primary motives and are called the "big three": the achievement motive, the power motive, and the affiliation/intimacy motive (McClelland, 1985). The *achievement motive* is the need to accomplish difficult activities in competition with a standard of excellence (n Achievement). The *power motive* is the need to have impact on others (n Power). The *affiliation motive* is the need to establish and maintain positive relations with other persons (n

Affiliation; Schultheiss, 2008). The *intimacy motive* (n Intimacy) is conceptually similar to the affiliation motive since it aims at the establishment and maintenance of positive relationships, too. However, these two motives can be differentiated: The intimacy motive is the need to have close relationships to familiar persons, while the affiliation motive can also be satisfied through friendly interactions with strangers or acquaintances (McAdams, 1980).

Implicit motives develop through affective experiences in early pre-lingual childhood (e.g., power motive: experience of positive affect as a consequence of having impact on others; McClelland & Pilon, 1983). They can be aroused by particular incentives that are linked to affective experiences (McClelland et al., 1953). However, implicit motives are not verbally represented and they operate mostly outside a person's awareness. Due to their unconscious nature, it is not possible to measure implicit motives with self-report questionnaires. Instead, implicit motives are assessed with a projective measurement technique that relies on imagination processes embracing affective reactions to pictorial cues. This technique is called Picture Story Exercise (PSE) and is derived from the Thematic Apperception Test (Morgan & Murray, 1935). In the PSE, participants are confronted with different picture cues that show persons acting in different social situations (e.g., a couple sitting on a bench by the river) evoking fantasies about how this situation (could develop) in order to satisfy needs. Participants are instructed to immerse into these situations and into the perspective of the depicted persons. Through the imagination process of need satisfaction, participants anticipate particular affective feelings that are associated with their implicit motives and, subsequently, motive specific affective feelings and thoughts emerge in the written imaginative stories. Thus, these picture cues elicit a motivational response (Pang, 2010).

Research documents validity of implicit motive scores assessed with the PSE for predicting behavior (McAdams & Vaillant, 1982; McClelland et al., 1989; McClelland & Boyatzis, 1982). For instance, a higher implicit achievement motive predicted higher scores on different performance tasks (Biernat, 1989; Brunstein & Hoyer, 2002; deCharms et al., 1955) and the affiliation and intimacy motives predicted the frequency of affiliative interactions (e.g., conversations, letter writing; McAdams & Constantian, 1983). In sum, differences in implicit motives have far-reaching consequences on behavioral outcomes.

Recent research suggests that implicit motives are linked to endocrinological responses. Researchers showed that the stimulation of implicit motives is closely tied to the release of specific hormones (e.g., power motive and testosterone and estradiol: Schultheiss,

2013; Schultheiss & Rohde, 2002; achievement motive and cortisol: Schultheiss et al., 2014; Yang et al., 2015; affiliation motive and dopamine and progesterone: McClelland et al., 1987; Schultheiss, 2013). For example, men with a high power motive respond with elevated salivary testosterone after winning a competition. This increase in testosterone, in turn, mediates better learning of the behavior that preceded the victory (Schultheiss & Rohde, 2002). In sum, hormones play a key role with regard to the motive specific affective experience. They accompany the satisfaction of an implicit motive and reinforce the learning of motive satisfying behavior (Schultheiss & Rohde, 2002).

Several studies found gender differences in the strength of implicit motives (e.g., Drescher & Schultheiss, 2016; McAdams, Lester, Brand, McNamara, & Lensky, 1988; Pang & Schultheiss, 2005; Schultheiss & Brunstein, 2001; Stewart & Chester, 1982). Women scored significantly higher on the affiliation and intimacy motive in these studies, but not on the achievement or power motive. These differences also remained significant when controlling for the higher verbal fluency of women, responsible for a higher number of written words in the motive test (Drescher & Schultheiss, 2016; Schultheiss & Brunstein, 2001).

Activity Inhibition

In research on implicit motives, *activity inhibition* was identified as an important moderator of the relationship between implicit motives and various outcomes. Activity inhibition originally was defined as the extent to which persons try to keep their emotional-motivational impulses under control (McClelland et al., 1972; for an overview, see Schultheiss & Brunstein, 2002). It is measured by counting the number of negating words (no, not) in the stories people write in a Picture Story Exercise (Schultheiss & Brunstein, 2002). Recent writings propose a theoretical extension of the concept of activity inhibition linking it to its neural correlates (Schultheiss et al., 2009). Schultheiss et al. (2009) propose that activity inhibition is an indicator for right hemispheric laterality, that is, a “propensity to engage functions of the right hemisphere (RH) and disengage functions of the left hemisphere (LH)” (p. 392). This conception of activity inhibition coincides with the literature on neurobiological foundations of motivated behavior, which shows that greater right frontal activation is associated with trait BIS (behavioral inhibition system; Gray, 1982) and avoidance behavior (Amodio, Master, Yee, & Taylor, 2008; Coan & Allen, 2003; Hewig, Hagemann, Seifert, Naumann, & Bartussek, 2004; Rutherford & Lindell, 2011; Sutton & Davidson, 1997).

The moderating role of activity inhibition has been shown for all three motive-domains. For example, researchers found that the implicit affiliation motive interacts with activity inhibition in predicting partner abuse committed by stressed women (Mason & Blankenship, 1987). Furthermore, only people with a high power motive who also score high on activity inhibition act highly convincing and are able to persuade their counterparts (Schultheiss & Brunstein, 2002). Hence, activity inhibition is an important moderator because it determines whether and how a person enacts the behavior suggested by a given motive, either in an approach-oriented, impulsive way or by inhibiting momentary impulses. It also determines if a person will channel the behavior in a socially appropriate and goal-directed way.

The Normative Development of Implicit Motives in Old Age

In the present research we assume that aged individuals show lower motive scores than younger individuals due to specific affective and physiological processes that change over the life course. These changes are thought to influence the affective and cognitive reactions to motive related incentive cues and thus cause a reduction in the strength of implicit motives.

First, although there are still many unresolved issues in the study of age-related changes in emotional perception and processing, there is strong evidence that aged adults react less strongly to specific affective situations than younger adults (for an overview: Röcke & Brose, 2013; Scheibe & Carstensen, 2010). A reduced affective reactivity might be due to the striving of aged adults for emotional stability. There is empirical evidence that aged adults show less variability in positive and negative affect as compared to young adults (Röcke & Brose, 2013; Röcke, Li, & Smith, 2009). The authors mention various reasons for this effect: To begin with, aged adults are experienced in dealing with their emotions leading to emotional stability through processes of emotion regulation. Furthermore, older adults' environment is very stable, because aged adults prefer familiar daily routines and their life-contexts are overall changing less than those of younger adults. Besides, it is necessary for aged adults to optimize their emotion regulation, because unpleasant events leading to mood impairments (e.g., health related events) are more likely to occur in later life than in young adulthood. Finally, a more consolidated self-concept protects the aged adults from affective short-term variations. These reasons lead to the assumption that aged adults might actively try to inhibit affective reactions to emotionally arousing situations. This assumption is supported by further empirical studies. For example, Gross et al. (1997) showed that aged adults

reported greater emotional control, but lesser emotional expressivity than younger adults. Another, more recent study showed that aged participants rated high-arousing stimuli as most unpleasant, while they rated low-arousing stimuli as most pleasant. The authors assume a gradual decrease of appetitive activation over the course of life (Keil & Freund, 2009). Hence, it is well conceivable that older adults do not want to experience strong (anticipatory) emotions, when they are confronted with affective incentives. This might affect the activation of implicit motives: The picture cues of the PSE were designed to elicit specific affects and, subsequently, implicit motives. However, the anticipation of motive satisfying affect is a necessary condition for triggering implicit motives (e.g., Job et al., 2012; Job & Brandstätter, 2009; Schultheiss & Brunstein, 1999). As a consequence of the lowered affective responsiveness to the picture cues in aged adults, fewer implicit motives might emerge in the imaginative stories, constituting a reduced expression of implicit motives in older adults.

Second, age dependent hormonal changes can cause a decrement in implicit motives. As reported above, the release of neurohormones plays a key role in motivation by implicit motives (McClelland et al., 1989). There is a strong relationship between the stimulation and satisfaction of implicit motives and the release of specific hormones, e.g., testosterone, estradiol, cortisol, dopamine and progesterone (McClelland et al., 1987; Schultheiss, 2013; Schultheiss et al., 2014). A complex interplay of these neurohormones with hypothalamic nuclei affects various motivational functions such as dominance and social affiliation (Schultheiss, 2013). Researchers argue that changing levels of neurohormones influence the brain areas responsible for the regulation of motivational functions such as responding to conditioned cues (Schultheiss, 2013).

There is research showing an age-related decline in hormonal levels (e.g., Ferrini & Barrett-Connor, 1998), a decline in the sensitivity to these neurohormones (e.g., Conrad & Bimonte-Nelson, 2010), and age-related impairment in brain structures (e.g., hypothalamus; Ferrari et al., 2001) that are responsible for processing these neurohormones. Presumably, these age-related changes have important consequences on the procession of affective signals and the affective responses in motive-related situations. Therefore, we assume that along with a decline in hormonal release and sensitivity, there is a decline in the strength of implicit motives. Researchers assume that the release of specific neurohormones enhance the rewarding effects in motive-related situations (Schultheiss, 2013). Subsequently, a decline in hormonal release may reduce the rewarding effects of a motive-related situation. The repeated experience of muted affective reactions makes the motive-specific behavior less

satisfying and rewarding. Eventually, this will result in a decrease of implicit motive strength since motive-specific behavior is no longer reinforced.

Finally, we assume that activity inhibition also changes across the lifespan. However, in light of contradicting theoretical points of view, two competing hypotheses emerge. On the one hand, one could expect an age-related decline in activity inhibition as aged adults show more socially inappropriate behavior than younger adults because they face higher levels of impulsivity, that is, lower impulse control (Hippel & Dunlop, 2005; Morales-Vives & Vigil-Colet, 2012). In the same vein, in light of the neurobiological conception of activity inhibition as an indicator of the propensity to engage right hemispheric functions a decline in activity inhibition would be predicted. There is some evidence that the right hemisphere is more affected by aging than the left hemisphere and that the hemispheric asymmetry decreases in older adults (Dolcos, Rice, & Cabeza, 2002). On the other hand, recent research suggests that age is associated with better self-regulation (for an overview: Hennecke & Freund, 2017). For example, aged adults revealed better self-regulation in eating behavior, affect and thought during a diet. If activity inhibition is seen as a marker of people's tendency to control their motivational impulses, one would assume a positive relationship with age.

In order to test the assumption of age-related differences in motive strength we deemed it necessary to measure all three implicit motive domains including activity inhibition in a large sample of adults covering a wide age range, and last not least, to control for several variables that might affect motive strength. Therefore, we tested implicit achievement, power, affiliation, and intimacy motives, as well as activity inhibition, considering various control variables.

Method

Participants and Procedure

Data is derived from an extensive study investigating intimate relationships and stress. In total, 736 participants[4] (368 heterosexual couples) were recruited by means of advertisements in the local newspapers, in local radio stations, and via announcements posted on bulletin boards. The majority of the sample was Swiss German (85 %); 3 % gave no information about their nationality, 8 % identified themselves as German, and the rest as dual citizenship owners (Swiss and other nationality) or other. The sample consists of three age

[4] Post-hoc power-analyses revealed a power of 1- $\beta = .98$ to detect a relationship between two variables with a small effect of $r = .15$ ($\alpha = 0.05$).

groups: young adults ranging from 20 to 35 years (n = 244, M = 27 years, SD = 5 years), middle-aged adults ranging from 40 to 55 years (n = 250, M = 47 years, SD = 5 years) and aged adults ranging from 65 to 80 years (n = 242, M = 71 years, SD = 5 years). As a result of the dyadic structure of the sample, gender of the participants is almost uniformly distributed. One woman refused the assessment of implicit motives and was excluded from all analyses. With regard to participants' highest degree of education, our sample appears to be of mixed educational backgrounds. Table 4 shows an overview of the highest degree of education separated for females and males and also separated for the different age groups.

Table 4

Highest Degree of Education Separated for Gender and Age Groups

	Women				Men			
	Total	G1	G2	G3	Total	G1	G2	G3
University degree (%)	31.8	45.5	32.0	17.6	49.3	42.6	58.9	46.3
High school (%)	21.4	25.6	20.0	18.5	12.5	23.8	5.6	8.3
Vocational training (%)	40.5	25.6	46.4	49.6	34.9	31.1	34.7	38.8
Secondary school (%)	3.8	3.3	1.6	6.7	1.9	1.6	0.8	3.3
Primary school (%)	2.5	0.0	0.0	7.6	1.4	0.8	0.0	3.3

Note. G1 = young adults; G2 = middle-aged adults; G3 = aged adults.

The data collection consisted of two parts. In the first part, participants were asked to complete some questionnaires at home and take them to the laboratory. In the second part, participants were invited to the laboratory at the university together with their partner. In addition to other questionnaires and measurements, they completed a handwritten individual assessment of implicit motives in an individual session with an experimenter. Couples received a payment of 100 Swiss Francs (approximately $103) in return for their participation.

Measures

Implicit motives were assessed with the Picture Story Exercise[5] (PSE; McClelland et al., 1989; Schultheiss & Pang, 2007). Participants were provided with the standardized introduction proposed by Pang (2010) on a piece of paper. The following introduction advised

[5] In the literature, a small internal consistency of motive scores is mentioned as a problem (e.g., Entwisle, 1972). This lack of consistency is due to the deliberate use of different picture cues, resulting in heterogeneous items (Schultheiss, Liening et al., 2008). However, the underlying aim of a good measurement is in first place to capture the construct of interest, or, in other words, to achieve a high validity. In the case of the PSE, using heterogeneous items leads to a broad caption of the different individual implicit motives and therefore to a high variability (Pang, 2010). There is research showing that high variability leads to high validity regardless of the internal consistency (Reuman, 1982). This research supports the assumption that the classical reliability theory is not applicable for PSE measures.

the participants to write a short imaginative story about each of the following six pictures[6]: (1) ship captain, (2) woman in laboratory, (3) nightclub scene, (4) trapeze artists, (5) architect at desk, and (6) couple by river (Schultheiss & Brunstein, 2001).

"In the Picture Story Exercise, your task is to write a complete story about each of a series of six pictures - an imaginative story with a beginning, a middle, and an end. Try to portray who the people in each picture are, what they are feeling, thinking, and wishing for. Try to tell what led to the situation depicted in each picture and how everything will turn out in the end." (Pang, 2010, pp. 135–136).

Participants were given four minutes to write each story. Thirty seconds before the end of time they were reminded by the experimenter to finish their narrative. At the end of the four minutes the experimenter told them to turn the page and proceed with the next picture. This procedure was repeated for all of the six pictures.

The content of each story was coded for motive specific content (achievement, power, and affiliation) by four independent coders following Winter's (1994) *Manual for scoring motive imagery in running text*. The coders were calibrated on an expert coding set in advance, and certified for scoring motive imagery in running texts. They reached an overall agreement of Cohen's Kappa at a minimum of 0.80 on the stories of 51 participants before they independently started coding the remaining PSE stories for this study. They coded all six stories of randomly assigned participants (partners were not separated) and were blind to age and gender of the participants. Equivocal scoring cases were periodically discussed.

The intimacy motive was scored separately by applying the coding manual by McAdams (1980) by two intensively trained and independent coders. They reached an overall agreement of Cohen's Kappa at a minimum of .85 on the stories of 16 participants before they separately started coding the stories. The additional coding of intimacy has the advantage that intimacy focuses more on the quality of intimate relationships than Winter's affiliation-intimacy codings. Activity inhibition was simply measured by counting the negation word "not" in the written texts (German: "nicht"; Schultheiss & Brunstein, 2002).

All codings for one motive were summed up per person and per picture to compute a score for every motive in each picture and also per person across all six pictures to obtain a

[6] These picture cues correspond to the standardized picture cue set of Schultheiss and Brunstein (2001). We selected these picture cues because they have a high pull for different implicit motives and, thus, maximize the variance of the measurement.

total motive score for each person. Table 5 and 6 show the two-tailed Pearson correlations among the total motive scores and age, and also the descriptive statistics of the raw total motive scores separated for women, men and age groups.

Table 5

Two-Tailed Correlations of Motive Scores, Activity Inhibition and Age

Variable	*n*Ach	*n*Aff	*n*Int	*n*Pow	Inhibition	Age
*n*Ach	—	-.03	.05	.12*	-.11	-.03
*n*Aff	.13*	—	.51**	-.14**	.12*	-.04
*n*Int	.12*	.51**	—	-.09	-.16**	-.12*
*n*Pow	.05	-.04	-.06	—	.10	.00
Inhibition	-.22**	-.19**	-.22**	.01	—	.08
Age	-.09	-.11*	-.15**	-.16**	.14**	—

Note. Correlations are computed with motive scores residualized for protocol length. Correlations of women (N = 367) are represented above the diagonal, correlations of men (N = 368) are represented below the diagonal. *n*Ach = Achievement motive; *n*Aff = Affiliation motive; *n*Int = Intimacy motive; *n*Pow = Power motive; Inhibition = Activity Inhibition.
** $p < .01$; * $p < .05$.

Table 6

Descriptive Statistics of Motive Scores, Written Words and Age

	Women				Men			
Variable	Total	G1 (*n* = 122)	G2 (*n* = 125)	G3 (*n* = 120)	Total	G1 (*n* = 122)	G2 (*n* = 125)	G3 (*n* = 121)
*n*Ach	1.53 (1.30)	1.81 (1.48)	1.67 (1.24)	1.10 (1.02)	1.55 (1.40)	1.98 (1.62)	1.61 (1.31)	1.07 (1.07)
*n*Aff	3.86 (1.97)	4.57 (1.95)	4.02 (1.90)	2.98 (1.71)	3.02 (1.74)	3.38 (1.65)	3.34 (2.59)	2.33 (1.62)
*n*Int	4.05 (2.73)	5.20 (2.92)	4.33 (2.61)	2.70 (1.98)	3.07 (2.59)	3.75 (2.97)	3.41 (2.59)	2.04 (1.74)
*n*Pow	1.92 (1.72)	2.40 (1.83)	2.04 (1.68)	1.31 (1.47)	1.96 (1.57)	2.66 (1.63)	1.95 (1.49)	1.27 (1.26)
Inhibition	2.97 (2.40)	3.53 (2.28)	3.10 (2.36)	2.27 (2.41)	2.85 (2.42)	3.02 (2.34)	3.38 (2.78)	2.12 (1.87)
Words	404.28 (132.51)	474.93 (97.98)	446.76 (109.68)	288.19 (105.37)	355.61 (116.41)	402.26 (88.59)	401.29 (104.85)	261.39 (93.98)
Age	47.23 (18.36)	26.25 (4.55)	45.92 (4.50)	69.93 (4.71)	49.30 (18.30)	28.15 (4.71)	48.37 (4.31)	71.60 (5.08)

Note. Mean scores and standard deviations (in parentheses) are given. Both are computed with raw motive scores. G1 = young adults; G2 = middle-aged adults; G3 = aged adults. *n*Ach = Achievement motive; *n*Aff = Affiliation motive; *n*Int = Intimacy motive; *n*Pow = Power motive; Inhibition = Activity Inhibition; Words = Number of written words.

Results

As we used data from couples, observations are statistically dependent (partners are nested within a dyad). Therefore, we used multilevel models that allow controlling for the dependency between the partners' data. To test differences in number of written words and in implicit motive scores across age and gender, random intercept cross-sectional mixed effects models with the number of words or, in a separate analysis, the particular motive score as the dependent variables were conducted in the statistical software R (version: 3.1.3).

We tested the non-independence of number of written words, implicit motive scores, and activity inhibition between partners by calculating the intraclass-correlations (ICC). Implicit motive scores and activity inhibition were controlled for verbal fluency. Significant ICC values speak for the non-independence of the data within the couple and the endorsement of multilevel modelling (Bliese, 2000; Nezlek, 2008). ICCs were significant for the number of written words (ICC(1) = .45, $p < .001$) and for the achievement motive (ICC(1) = .13, $p < .01$). They were nonsignificant for the other motives and for activity inhibition (power: ICC(1) = .03, p =.31; affiliation: ICC(1) = .05, p = .16; intimacy: ICC(1) = .04, p = .20; activity inhibition: ICC(1) = .07, p = .10). Because the number of written words is a curtailing control variable the significant ICC speaks for the use of multilevel modeling.

Additional analyses revealed that linear models fit the data better than quadratic or cubic models. Therefore, we included the age group (young, middle-aged, aged) in all analyses not as a categorical variable, but the participant's individual age as a continuous variable. The usage of a continuous variable has the advantage that it keeps information about the actual age of the participants and enables linear transformations.

In all analyses protocol length (the total number of words written by each participant) was included as a control variable. This allowed us to take into account that motive scores and protocol length are typically highly correlated. Researchers typically residualize motive scores or else correct for protocol length whenever they use the motives as predictor variables (e.g., Pang, 2010; Smith, Feld, & Franz, 1992). Since motive scores represent the outcome variables in the present analyses controlling for protocol length is adequate.

Analysis of Story Length across Age and Gender

First, we calculated multilevel regression analyses to predict number of written words based on gender and age. The analysis revealed significant differences in number of words for age and gender. Age negatively correlated with the number of written words, b = -4.33,

SE = 0.29, *t*(364) = -14.89, *p* < .001, and women wrote significantly more words than men, *b* = -40.69, *SE* = 6.41, *t*(364) = -6.35, *p* < .001. Also the interaction term of age and gender was significant, *b* = 1.02, *SE* = 0.35, *t*(364) = 2.92, *p* < .01. Simple slope analyses (Preacher, Curran, & Bauer, 2006) revealed that slopes corresponding to the gender of young participants (mean score of the first age group), slope = -62.58, *p* < .001, and middle-aged participants (mean score of the second age group), slope = -38.62, *p* < .001, differed significantly from zero. In these two age groups women wrote significant longer stories then men. In contrast, no gender differences in the number of written words were found for older participants (mean score of the third age group), slope = -15.68, *p* = .12 (Figure 1).

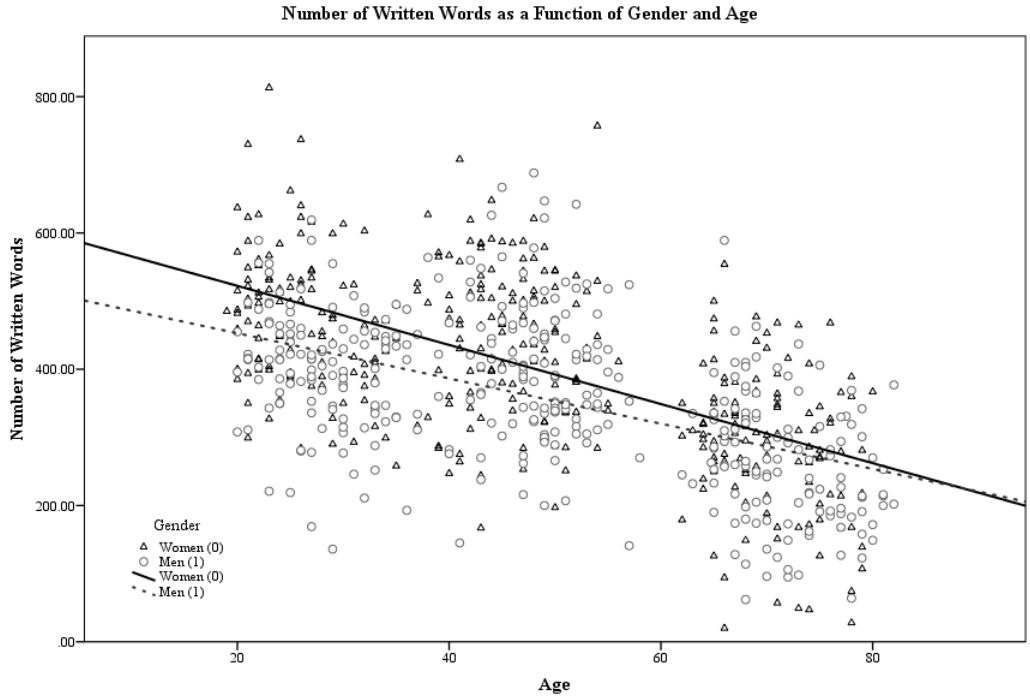

Figure 1. Number of written words as a function of gender and age.

Analyzing Implicit Motive Scores across Age and Gender

We tested separate multilevel regression models for achievement, power, affiliation, intimacy, and activity inhibition including age, gender, and their interaction as the focal predictors. The number of words and coder[7] were included as control variables. Gender was dummy coded (0 = women, 1 = men). Participants were divided into five groups. Four groups

[7] Because it is probable that coders' implicit motives and gender bias the motive score of the coded text, it is important to control for the influence of the particular coder.

were coded by one of the four coders only. The fifth group was coded by the entire coding-team. Four coder dummy variables were created, each of them representing one of the four coders (1 = $coder_x$, 0 = all others). Participants of the fifth group (N = 51) had a value of zero on all four coder variables and represent the reference group against which the single coders are compared. Intimacy was separately coded by only two independent coders. The coders of intimacy were coded by one dummy variable. Age and number of words were centered on the grand mean, to avoid problems of multicollinearity and to simplify interpretation. Since the interaction between age and gender was nonsignificant in each analyses, it was dropped from the final models.

As expected, the number of written words significantly correlated with all four implicit motives as well as with activity inhibition (Tables 7-11). In addition, there was a coder-effect for the achievement and power motive scores confirming the necessity of controlling for coders in the analyses.

Regarding the achievement motive (Table 7), significant age differences, b = -0.01, SE = 0.00, t(362) = -2.52, p < .05, and significant gender differences appeared, b = 0.20, SE = 0.09, t(362) = 2.23, p < .05. Higher age corresponded with lower achievement motive scores and men showed higher achievement motive scores than women.

Table 7

Multilevel Regression of the Implicit Achievement Motive

Variable	Parameter estimate	*SE*	*df*	t	95 % CI
(Intercept)	1.697	0.18	365	9.36***	1.341, 2.054
Gender	0.197	0.09	362	2.23*	0.023, 0.372
Age	-0.008	0.00	362	-2.52*	-0.014, -0.002
Words	0.003	0.00	362	7.39***	0.002, 0.004
Coder 1	0.243	0.21	365	1.14	-0.177, 0.664
Coder 2	-0.256	0.19	362	-1.35	-0.628, 0.116
Coder 3	-0.112	0.22	365	-0.50	-0.554, 0.330
Coder 4	-0.646	0.20	362	-3.27**	-1.034, -0.258

Note. Gender was coded as 0 = women, 1 = men; Coder 1 to Coder 4 were coded as 1 = $coder_x$, 0 = all others; Different dfs for coders result from the fact that they coded different numbers of stories. Age and number of words were centered on the grand mean.
*** p < .001; ** p < .01; * p < .05.

Regarding the power motive (Table 8), significant differences in age, b = -0.01, SE = 0.00, t(362) = -2.60, p < .01, and gender occurred, b = 0.32, SE = 0.11, t(362) = 2.98,

$p < .01$. Age negatively correlated with power motive scores and men expressed more power than women.

Table 8

Multilevel Regression of the Implicit Power Motive

Variable	Parameter estimate	*SE*	*df*	t	95 % CI
(Intercept)	2.147	0.21	365	10.13***	1.730, 2.563
Gender	0.320	0.11	362	2.98**	0.109, 0.531
Age	-0.009	0.00	362	-2.60**	-0.016, -0.002
Words	0.005	0.00	362	10.16***	0.004, 0.006
Coder 1	-0.192	0.25	365	-0.78	-0.680, 0.295
Coder 2	-0.540	0.22	362	-2.44*	-0.975, -0.105
Coder 3	-0.198	0.26	365	-0.76	-0.710, 0.314
Coder 4	-0.371	0.23	362	-1.62	-0.822, -0.080

Note. Gender was coded as 0 = women, 1 = men; Coder 1 to Coder 4 were coded as 1 = $coder_x$, 0 = all others; Different dfs for coders result from the fact that they coded different numbers of stories. Age and number of words were centered on the grand mean.
*** $p < .001$; ** $p < .01$; * $p < .05$.

Regarding the affiliation motive (Table 9), there were significant age differences, $b = -0.01$, $SE = 0.00$, $t(362) = -2.83$, $p < .01$, and significant gender differences, $b = -0.56$, $SE = 0.12$, $t(362) = -4.55$, $p < .001$. Higher age came along with lower affiliation motive scores. Further, replicating past research (Schultheiss & Brunstein, 2001), women scored higher on the implicit affiliation motive than men.

Table 9

Multilevel Regression of the Implicit Affiliation Motive

Variable	Parameter estimate	*SE*	*df*	t	95 % CI
(Intercept)	3.754	0.25	365	15.26***	3.270, 4.238
Gender	-0.560	0.12	362	-4.55***	-0.802, -0.318
Age	-0.012	0.00	362	-2.83**	-0.020, -0.004
Words	0.005	0.00	362	8.64***	0.004, 0.006
Coder 1	0.468	0.29	365	1.62	-0.100, 1.036
Coder 2	-0.079	0.26	362	-0.31	-0.584, 0.426
Coder 3	0.088	0.30	365	0.29	-0.508, 0.685
Coder 4	-0.290	0.27	362	-1.09	-0.815, 0.235

Note. Gender was coded as 0 = women, 1 = men; Coder 1 to Coder 4 were coded as 1 = $coder_x$, 0 = all others; Different dfs for coders result from the fact that they coded different numbers of stories. Age and number of words were centered on the grand mean.
*** $p < .001$; ** $p < .01$; * $p < .05$.

Regarding the intimacy motive (Table 10), again age, b = -0.03, SE = 0.01, $t(364)$ = -4.36, $p < .001$, and gender differences appeared, b = -0.65, SE = 0.18, $t(364)$ = -3.57, $p < .001$. Higher age corresponded with lower scores in the intimacy motive and women scored higher on the intimacy motive than men.

Table 10

Multilevel Regression of the Implicit Intimacy Motive

Variable	Parameter estimate	*SE*	*df*	t	95 % CI
(Intercept)	3.735	0.17	366	22.06***	3.402, 4.068
Gender	-0.645	0.18	364	-3.57***	-1.000, -0.290
Age	-0.026	0.01	364	-4.36***	-0.038, -0.014
Words	0.006	0.00	364	6.60***	0.004, 0.008
Coder	0.254	0.19	366	1.37	-0.111, 0.620

Note. Gender was coded as 0 = women, 1 = men; Coder was coded as 0 = first coder, 1 = second coder. Age and number of words were centered on the grand mean.
*** $p < .001$; ** $p < .01$; * $p < .05$.

Regarding activity inhibition (Table 11), there were significant age, b = 0.02, SE = 0.01, $t(364)$ = 3.59, $p < .01$, and gender differences, b = 0.39, SE = 0.15, $t(364)$ = 2.62, $p < .01$. Higher age came along with more activity inhibition, and men showed more activity inhibition than women.

Table 11

Multilevel Regression of Activity Inhibition

Variable	Parameter estimate	*SE*	*df*	t	95 % CI
(Intercept)	2.713	0.11	367	25.07***	2.501, 2.926
Gender	0.393	0.15	364	2.62**	0.098, 0.688
Age	0.018	0.01	364	3.59***	0.008, 0.028
Words	0.011	0.00	364	15.40***	0.010, 0.013

Note. Gender was coded as 0 = women, 1 = men. Age and number of words were centered on the grand mean.
*** $p < .001$; ** $p < .01$; * $p < .05$.

Discussion

The aim of the present analyses was to examine age differences in implicit motives, measured through the Picture Story Exercise (PSE). As expected, significant age differences were found for all motive scores. The scores of achievement, power, affiliation, and intimacy motives were smaller with increasing age. In contrast, age was positively correlated with activity inhibition. Further, significant gender differences were found for all motives. Women

showed higher scores in the implicit affiliation and intimacy motive than men, while men scored higher in the implicit achievement and power motive than women.

Age Differences in Motive Scores

Results indicate a significant negative relationship between age and the scores of all four measured implicit motives. These results are in line with some research reporting age differences in the implicit power motive (Franz, 1994; McClelland et al., 1998; Schultheiss & Brunstein, 2001; Veroff et al., 1984), the implicit achievement motive (Franz, 1994; Veroff et al., 1984), and the implicit affiliation and intimacy motive (McClelland et al., 1998; Schultheiss & Brunstein, 2001; Veroff et al., 1984). Our study confirmed these age differences in implicit motives with an extensive sample of adults covering the whole age range from 20 years to 80 years. We assume that age-dependent changes in affective and neuroendocrinological reactivity are responsible for these differences in implicit motive scores. As people age they get less responsive to emotional stimuli (Röcke & Brose, 2013) and therefore, as we assume, they respond less to the affective incentives typically activating an implicit motive. Further, attenuated hormonal responses (Conrad & Bimonte-Nelson, 2010; Ferrari et al., 2001; Ferrini & Barrett-Connor, 1998), might reduce the rewarding experience following motive-driven behavior, which may further reduce implicit motive strength in the long-term. Future research should test the specific mechanisms involved in the developmental changes in implicit motive dispositions.

Lowered scores in implicit motives in aged persons might have a far-reaching impact on the life of aged persons. It is well known that implicit motives orient, select, and energize behavior (McClelland, 1985) and, thus, influence the process of goal setting and attainment. A normative decline in implicit motives could entail that aged adults set fewer goals in the domains of power, achievement, affiliation and intimacy. They may further withdraw from environments that require high achievement effort, exerting power, or social affiliation (e.g., maintenance of big social networks).

However, it is important to consider possible alternative explanations. First, one could object that aged adults show lower implicit motive scores than younger adults, because they did understand the instructions of the PSE differently. Therefore, they might describe the pictures in detail instead of writing imaginative stories with motive content. Indeed, analyses of the written stories in our study showed that many aged adults actually described the pictures in detail instead of inventing an imaginative story. This finding, however, is not

necessarily a proof for a misunderstanding of instructions because it is also consistent with our assumption of a lowered affective responsiveness to motive incentives in aged adults.

Second, it is possible that aged adults show deficits in the capacity to see things from another point of view (Bailey & Henry, 2008). In all of the pictures we used, different persons are depicted. Participants had to take the perspective of these persons to write imaginative stories about their feelings and thoughts. If it is difficult for aged adults to see the world from the perspective of the depicted persons, they might tend to describe the pictures. Thus, there might not necessarily be a misunderstanding of the instructions, but rather a deficit in responding to the picture cues because of lowered affective responsiveness or deficits in perspective taking in older adults. As this perspective taking is an integral part of how implicit motives are assessed, we cannot rule out this possibility while using the standard PSE. Maybe advancements in motive assessment will make it possible in the future to measure implicit motives without the premise of perspective taking.

Furthermore, one could object that the limited writing time of four minutes for each story was a confounding factor resulting in lowered implicit motive scores of aged participants. It might be necessary to allow the aged participants more writing time. Due to the workload for participants in our study, we gave all participants only four minutes to reduce their subject burden. This might have been too little time for older adults, who might take longer to comply with the task of writing a fantasy story. In future research, it should be tested whether the standard procedure of giving five minutes, suggested by Pang (2010), results in longer stories from older adults. However, Pang (2010) mentioned that reducing writing time to four minutes does not dramatically affect the amount of codable material. Besides, Bernecker and Job (2011) found that writing time is not a significant predictor of motive scores.

Personality research has also shown that various personality dispositions are less pronounced in old age than in young age (e.g., extraversion, openness; Specht et al., 2011). Researchers trace these changes back to environmental factors (social demands, life experiences) as well as to biological maturation. They assume that both factors are equally responsible for age-dependent changes in an interactive way (Specht et al., 2011). In our reasoning, we assumed biological maturation (changes in affective, cognitive and physiological functions) to be the main cause of age differences in implicit motives. We do not want to rule out, though, that specific environmental factors (such as social demands) could also be responsible for age differences in implicit motives.

Due to the cross-sectional character of the study, the age differences could be based on cohort effects or selective mortality. For example, did children born before or during World War II have fewer opportunities to develop high implicit motives than the later generations? Or, are there less highly motivated individuals represented in the older-participant sample because high implicit motives expose people to more mortality risks? An argument that speaks against pure cohort effect is the fact that our sample of older participants in their 60ies to 80ies (born between 1930 and 1950) actually do not form a homogenous group as they grew up under completely different social and economic circumstances – in the years of great economic and politic upheaval prior to and during World War II vs. the beginning of a long period of peace and great economic prosperity in Western Europe. Nevertheless, only a cohort-sequential longitudinal design following participants from early adulthood into old age allows to distinguish variance in implicit motives caused by cohort effects or mortality from actual intra-individual age dependent changes.

With respect to activity inhibition, we had formulated two competing hypotheses. One could have either expected an age-related decline due to respective neuropsychological changes (Dolcos et al., 2002; Schultheiss et al., 2009; Sutton & Davidson, 1997), or an age-related increase due to better self-regulation capacities of aged individuals (Hennecke & Freund, 2017). Our data support the latter hypothesis as we found a higher activity inhibition in older as compared to younger adults. We interpret this finding in accordance with Hennecke's and Freund's (2010, 2015) line of argument that aged adults show better self-regulatory abilities than younger adults. Researchers trace these self-regulatory improvements back to improvements in motivational competence and accumulated experiences across adulthood (Freund, Hennecke, & Riediger, 2010; Hennecke & Freund, 2010, 2015). They state that these improvements in self-regulation might also be due to age-related improvements in affect regulation skills and that "this route might be accessible to older adults even if their inhibitory skills might have already declined (Hasher et al., 1999)." (Hennecke & Freund, 2015, p. 16).

Gender Differences in Implicit Motive Scores

Women showed higher motive scores in affiliation and intimacy, while men showed higher motive scores in achievement, power, and activity inhibition. Previous research already found differences in implicit affiliation and intimacy motives (Drescher & Schultheiss, 2016; McAdams et al., 1988; Schultheiss & Brunstein, 2001). Yet, our findings of gender differences in achievement, power, and activity inhibition are new. Previous research did

neither show any differences between men and women in the achievement and the power motive, nor in activity inhibition (Drescher & Schultheiss, 2016; Pang, 2010). One reason for these findings might be the composition of our sample. Men reported a slightly higher education than women (see Table 4). The gender differences in motive scores might be explained according to social structural factors (e.g., education) and occupational structures as Veroff et al. (1984) and Jenkins (1987, 1994) stated. Thus, the higher education of men in our sample might be an explanation of their higher achievement and power motive scores in our study. However, our data refutes this assumption: Although men reported a higher education than women, education is not correlated with the achievement (r = .02, p = .60) and the power motive scores (r = .06, p = .09).

An alternative explanation of gender differences in our study might be the specific sociocultural context of our sample. The present findings were obtained in Switzerland with a majority (more than 85 %) of Swiss German participants. Switzerland is a country with a comparatively strong focus on traditional values and traditional gender roles (Bernardi, Ryser, & Le Goff, 2011; Kelso, Cahn, & Miller, 2012) that might be responsible for a gender specific development of implicit motives. In more traditional sociocultural contexts, women are socialized to focus on affiliation and intimacy, men, in contrast, are socialized to focus on achievement and power (North & Fiske, 2014). Moreover, the late introduction of women's right to vote on a federal level in 1990 underpins this assumption and might explain, why Swiss women exhibit lower achievement and power motives than women in other countries (e.g., Drescher & Schultheiss, 2016).

Additionally, it might be possible that these gender differences are a typical characteristic of implicit motives similar to gender differences in explicit goals and life values. For example, recent research on gender differences in life goals demonstrated in many studies that women perceived power-related goals as less important than men (Gino, Wilmuth, & Brooks, 2015). A recent review showed that women expressed stronger preferences for interpersonal goals (e.g., focusing on family and community) than men, whereas men expressed stronger preferences for agentic goals (e.g., high impact careers, high social status) than women (Massey, Gebhardt, & Garnefski, 2008). Although we replicated these results on an implicit level with high statistical power, it is up to future studies to clarify the main reasons of emerging gender differences in implicit motives. Presumably, these gender differences are not only genetically determined, but also socialized.

Conclusion

The present study demonstrated significant differences in implicit motives across age and gender. All implicit motive scores were decreased in aged participants. These results show that there are changes in implicit motives over the course of life. The common stability assumption in adult personality for dispositional factors is not tenable for implicit motives. Similar to personality traits, implicit motives differ over the course of life.

Part III:

Influences of an Intimate Relationship on Implicit Motives

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Abstract

Research has evidenced positive effects of dyadic similarity in various characteristics, such as values, attitudes and personality traits. Despite the well-known influence of motivational constructs on the functioning of intimate relationships, the investigation of dyadic similarity in motivational constructs has been neglected so far. We aimed to close this gap and extend existing research on spouses' similarity in an extensive heterogeneous dyadic data set (N = 368 couples). We investigated the dyadic similarity of life goals and implicit motives, additionally examining relationship duration as one important predictor for similarity. With regard to life goals, results indicated a similarity, but no increase in similarity with longer relationship duration. With regard to implicit motives, our results showed a positive relationship between the similarity in implicit motives and relationship duration. We interpret the results concerning similarity in the context of assortative mating and convergence effects: Individuals choose a partner who has similar life goals at the beginning of their relationship, while spouses converge to each other in their implicit motives as they get better acquainted with each other.

Introduction

The popular Asian-English saying "Same same but different" is often printed on t-shirts, preferably with "same same" on the front and "but different" on the back. Individuals display the front to others, while the back usually remains hidden. Visible and invisible components are also present in romantic relationships and in partner selection processes. Individuals often choose their partners according to a similarity of visible components, or simply put: they choose "same same". Unfortunately, they often do not take the invisible components into account. Consequently, spouses are dissimilar in these invisible characteristics, in other words, they are "same same but different".

The similarity of spouses in intimate relationships is a frequently discussed topic in popular as well as in scientific literature. It is well documented that spouses perceive a higher relationship satisfaction (e.g., Acitelli, Kenny, & Weiner, 2001; Gaunt, 2006; Gonzaga, Campos, & Bradbury, 2007) and even achieve higher relationship stability (e.g., Bleske-Rechek, Remiker, & Baker, 2009; Kurdek, 1993) when they are similar to each other in various psychological characteristics. Previous research has documented this relationship for variables such as values and attitudes, emotionality, and personality traits (Acitelli et al., 2001; Anderson et al., 2003; Gonzaga et al., 2007; Gonzaga et al., 2010; Luo et al., 2008), but not for motivational variables.

However, an intimate relationship is made up of interpersonal behaviors that are motivated and goal-directed (Horowitz et al., 2006). Two fundamental motivational variables influence these behaviors in important ways: implicit motives and goals. While implicit motives are unconscious affective needs that influence spontaneous behavior, goals are cognitive and conscious orientations that influence elaborated behavioral choices (McClelland et al., 1989). These motivational variables determine the ability to experience reward and joy through goal progress and need satisfaction in interpersonal relationships (Avivi, Laurenceau, & Carver, 2009). Because implicit motives and conscious goals influence a major part of the communication and the behavior in an intimate relationship, the investigation of motivational variables is crucial when analyzing dyadic relationships. Empirical research has confirmed the influence of conscious goals as well as the influence of unconscious implicit motives on relationship satisfaction and stability (e.g., Hagemeyer et al., 2013; Sanderson & Cantor, 1997). To our knowledge, no systematic research has been conducted into similarities in motivational constructs (for an exception see Arránz Becker, 2013). In particular, the influence of relationship duration on spouses' similarity in their goals and implicit motives

has not been addressed. In addition, if goals and implicit motives as well as spouses' similarity in these variables influence relationship quality in important ways, it would be relevant to know if partners are similar in these motivational variables at the beginning of their relationship or if they converge over the course of the relationship. Our study therefore deals with two issues: First, are spouses similar to each other in their fundamental motivational orientations? Second, how does relationship duration influence the similarity of spouses with regard to these motivational orientations? Do spouses start their relationship with similar goals and similar implicit motives or do they become more similar to each other regarding their goals and implicit motives with increasing relationship duration? We addressed these issues in an extensive sample of 368 heterosexual couples using a cross-sectional and longitudinal design.

Similarity in a Relationship

Researchers argue that individuals shape their social environments by choosing similar interaction partners (Bahns, Crandall, Gillath, & Preacher, 2016). These similarity-based environments may be assumed to provide many advantages for the individuals involved in the interaction. First, humans generally strive to fulfill their needs and goals. Seeking the company of similar others is an advantage, because social groups with shared similarities are more effective in gaining necessary resources for their need and goal fulfilment than dissimilar groups (Odling-Smee, Laland, & Feldman, 2003). Besides, the communication, cooperation, and coordination is better with others who share similar interests, values, and attitudes than with dissimilar others (McPherson, Smith-Lovin, & Cook, 2001). Additionally, the exchange of shared values and beliefs between similar interaction partners protects the individuals' self-esteem from contradictory influences (i.e., through social comparison, feedback) and leads to heightened trust as the basis for a long-lasting relationship (Bahns, Crandall, Gillath, & Preacher, 2016; Ziegler & Golbeck, 2007).

Spouses may be similar to each other for two reasons. First, individuals tend to establish relationships with other persons who have similar physiological, psychological and behavioral characteristics (Hunt, Eastwick, & Finkel, 2015). This selection process is called *assortative mating* and has been empirically demonstrated for a large number of attitudes, values, prejudices, personality traits and behaviors (e.g., Alford, Hatemi, Hibbing, Martin, & Eaves, 2011; Bahns, Crandall, Gillath, & Preacher, 2016; Burleson & Denton, 2009; Watson et al., 2004). Researchers claim that individuals are able to make very fast and accurate assessments about the interests, values and traits of interaction partners. They argue that

individuals are capable of assessing the degree of similarity to significant others in the initial phase of getting to know each other. Based on this assessment, individuals decide whether or not to relate to another individual (see Bahns, Crandall, Gillath, & Wilmer, 2016; Bahns, Crandall, Gillath, & Preacher, 2016 for an overview). Thus, there are presumably specific characteristics that are clearly discernible to others at the beginning of a relationship. Apparently, the assortative mating effects emerge according to social judgement processes and to the visibility of important characteristics. Following the metaphor of the t-shirt with the Asian-English slogan, assortative mating effects correspond to the phrase "same same" on the front of the t-shirt that is highly visible at the beginning of a relationship.

Second, romantic partners may not only be similar at the beginning of the relationship, but also may become more similar with increasing relationship duration. Such *convergence effects* can be explained by theories of social influence or social tuning. These theories assume that individuals adjust their attitudes, affective states, memories and basic experiences to close significant others over time (Shteynberg & Galinsky, 2011). Convergence effects occur due to an increase in intimacy and in communication when partners know each other better (Bahns, Crandall, Gillath, & Preacher, 2016). These effects have been empirically demonstrated for emotionality (Anderson et al., 2003), values and attitudes (Acitelli et al., 2001), attitudinal flexibility and mental abilities (Gruber-Baldini, Schaie, & Willis, 1995), and social perception (Deutsch & Mackesy, 1985). We assume that various characteristics are not visible and communicable at the beginning of the relationship, but are very important for the progress of the relationship. Referring to the metaphor of the t-shirt, these characteristics are printed on the back of the t-shirt which mostly remains hidden at the beginning of the relationship. Thus, they cannot be objectives for assortative mating effects. In light of the importance of these hidden variables for the progress of the relationship, this might result in convergence effects in these characteristics with increasing relationship duration (see also Murstein, 1970, for a similar argument). Generally, convergence effects are also possible for "visible" characteristics. However, if we assume that partners already are similar in these characteristics at the beginning of a relationship due to assortative mating, there probably is less room for converging in visible characteristics than in hidden characteristics.

Similarity of Life Goals and Implicit Motives

Life goals and implicit motives refer to different domains of motivating incentives. The contents of these motivational strivings can be subsumed in different higher-order motivational dimensions. We focus in this article on dimensions that were most frequently

studied by researchers in recent years: achievement, power, affiliation and intimacy. Life goals and implicit motives in the domain of achievement are about mastering challenges and attaining a high standard of excellence. Motivational strivings in the domain of power aim at having impact on others. Whereas life goals and implicit motives in the domain of affiliation are about establishing, maintaining or restoring positive relationships with others, the motivational strivings in the domain of intimacy focus more on strong and positive interpersonal relationships with familiar persons (McClelland, 1985; Schultheiss, 2008).

Life goals. Goals are defined as consciously and cognitively accessible internal representations of "desired states that people seek to obtain, maintain, or avoid" (Emmons, 1996, p. 314). In general, goals can vary widely across the level of abstraction resulting in different goal contents and characteristics. They can be hierarchically sorted from very abstract and broad long-term goals such as life goals or personal strivings (e.g., "I want to have a lot of friends in my life"; e.g., Emmons, 1986) to more concrete goals such as current concerns and personal projects (e.g., "I want to have a better job"; e.g., Little, 1983) and even to very specific goals such as life tasks (e.g., "I want to work with my partner on our conflict resolution"; e.g., Cantor & Malley, 1991). Typically, several lower-order goals are assigned to an abstract higher-order goal (Austin & Vancouver, 1996). The focus of this research article is on life goals. They operate on an abstract level and act as superordinate goals. Thus, they provide points of reference for the shaping of individuals' lives (Pöhlmann & Brunstein, 1997). They are durable, long-term concerns that guide behavior stably and consistently across time and context (Emmons, 1996). These goals are anchored within the social context and influence conscious attitudes, choices and decisions in response to structured situations (McClelland et al., 1989). As goals are conscious entities (Emmons & Kaiser, 1996), people form opinions about themselves that are communicated in conversations with others (McClelland et al., 1989). Empirical evidence indicates that individuals are able to recognize and report these opinions, in other words the goals of their interaction partners (McClelland, 1972a; Jackson, 1974).

Further, there is evidence that relationship partners share their goals and affect each other in setting and pursuing goals (Salmela-Aro, Nurmi, Saisto, & Halmesmaki, 2010; Rusbult, Finkel, & Kumashiro, 2009). Jointly pursuing activities that meet both partners' goals as well as goal support from the partner are positively associated with goal progress, high levels of enjoyment, affective well-being, and relationship quality (Brunstein, Dangelmayer, & Schultheiss, 1996; Gere, Schimmack, Pinkus, & Lockwood, 2011; Koestner,

Powers, Carbonneau, Milyavskaya, & Chua, 2012). In sum, it might be more advantageous for individuals and even for the functioning of their relationships to select a partner with similar goals instead of selecting a partner with differing goals (Fitzsimons et al., 2015).

Along with values and beliefs, life goals are an integral part of the individual and conscious self-concept. We therefore assume that life goals act as obvious characteristics that are communicated and visible to others in the initial phase of getting to know each other. Thus, we hypothesize a high similarity between spouses' life goals. If individuals choose a partner who is already very similar in terms of life goals, we expect only little convergence effects over the course of the relationship because it might be difficult to increase similarity further. In other words, we hypothesize that relationship duration is not associated with the similarity in life goals.

Implicit motives. Whereas life goals are conscious representations of desired states, implicit motives are defined as enduring, mostly unconscious needs. They are affective preferences for specific situational incentives (e.g., talking to other people or competitive situations; McClelland, 1985; Schultheiss, 2008). Implicit motives are acquired and shaped through affective experiences in early childhood (McClelland & Pilon, 1983). Depending on these individual learning experiences, individuals differ in their motive strength. It is assumed that individuals prefer situations which provide affective incentives that are similar to their learning experience and, consequently, situations that are congruent with their implicit motives. Implicit motives energize and direct individual behavior (McClelland, 1985; Schultheiss, 2008), and were originally defined as stable individual characteristics that constitute a certain aspect of the individual's personality (McClelland, 1980).

There is however evidence for their malleability. Studies document that they change in the course of one's life due to social demands and life experiences (Veroff et al., 1984; McClelland et al., 1998) and that they can be activated by situational factors (McClelland & Winter, 1969; Schultheiss et al., 2004). This is not surprising because implicit motives are interdependent with various factors (e.g., emotions, experiences, physiological influences) that may lead to a change in their strength. Presumably, spouses may indirectly influence each other, leading to a convergence in their implicit motives over the course of their relationship. As the relationship duration increases, partners get better acquainted with each other and share more and more common (affective) experiences (Hoppmann & Gerstorf, 2009). They also become increasingly dependent on each other and influence each other's activities (Gere & Schimmack, 2013). Consequently, partners become more and more similar over time due to

their (shared) experiences and activities (e.g., hobbies). The shared living environments as well as the shared experiences are linked to specific affects. As noted above, implicit motives develop through affective experiences and are activated through affective incentives. Considering the strong association between affect and implicit motives, it is feasible that the implicit motives of the partners converge over time due to the convergence of experiences and respective affects. This assumption is supported by the fact that affective responses (Anderson et al., 2003) and affective experiences (Gonzaga et al., 2010) of partners converge over time. In addition to convergence effects, as a result of learning experiences, the strength of implicit motives may also be reinforced by the repeated execution of motive-relevant behavior. Presumably, as implicit motives manifest in spontaneous behavior and as spouses show increasing engagement in similar behavior, such as cuddling up in the evening or performing competitive sports, this may additionally contribute to a mutual adjustment of implicit motives. To summarize, shared activities and affective experiences of spouses may cause convergence effects in implicit motives with increasing relationship duration.

In addition, we assume that implicit motives function more like covert characteristics. Implicit motives are unconscious and not even discernible by introspection. Therefore, spouses will not be aware of the other's implicit motives until they know each other better. Consequently, we expect no assortative mating effects for implicit motives. In other words, we hypothesize that the longer partners have been together, the more similar they should be in motive strength. There should be little or no similarity in partners' implicit motives at the beginning of the relationship.

We tested our hypotheses about the similarity of partners in terms of their goals and implicit motives and about the influence of relationship duration on spouses' similarity in these motivational variables in an extensive dyadic data set composed of 368 heterosexual couples ranging from one to 60 years of relationship duration, cross-sectionally as well as, in the case of life goals, longitudinally.

Method

Participants and Age-Groups

Data was taken from an extensive longitudinal study investigating intimate relationships and stress. Some of the data concerning other research questions have already been published (cf. Backes et al., 2016; Denzinger et al., 2016; Kuster et al., 2015; Landis et al., 2014; Neysari et al., 2016; Zemp, Bodenmann, Backes, Sutter-Stickel, & Bradbury, 2016;

Zemp, Bodenmann, Backes, Sutter-Stickel, & Revenson, 2016). There is no overlap between the research question and results of the published articles. In total, 368 heterosexual intimate couples were recruited by means of advertisements in local newspapers, on local radio stations, and via announcements posted on bulletin boards. Inclusion criteria required couples to be fluent in German and to have been in their intimate relationship for at least one year. Concerning implicit motives, we analyzed data from the first data wave, the only time at which motives were assessed. Concerning life goals, data was available from Wave 1 to 3 (yearly assessment).

As a result of the dyadic structure of the sample, the gender of the participants was uniformly distributed. One woman rejected the assessment of implicit motives. Therefore we excluded the entire couple from all analyses involving implicit motive scores. Another two couples were excluded from all analyses involving life goals due to missing data. The average age of the women was *M* = 47 years (*SD* = 18 years, range = 19 – 80) and the average age of the men was *M* = 49 years (*SD* = 18 years, range = 20 – 82) at the first measurement point. Most of our participants were Swiss German (85%); 3% gave no information about their nationality, 8% indicated to be German, and the rest identified themselves as dual citizens (Swiss and another nationality) or other. The average relationship duration of couples (mean score of women and men) was *M* = 21.9 years (*SD* = 18.3 years; range 1-60 years).

Procedure

Interested couples contacted us in response to the advertisements. We made appointments to come to the laboratory with all couples that met the inclusion criteria. Data collection consisted of two parts. In the first part, we asked the participants to complete some questionnaires, including the life goals questionnaire, at home and to bring them to the laboratory. In the second part, we invited all couples to the laboratory at the university. In addition to further questionnaires and measurements, they completed a handwritten and individual assessment of implicit motives in an individual session with an experimenter. We reassessed the life goals questionnaire one (*N* = 296) and two years later (*N* = 241). Couples received a payment of 100 Swiss Francs (approximately $108) in return for their participation at the first measurement point. We raised the payment at later measurement points (120 CHF at the second and 130 CHF at the third measurement point). All procedures were evaluated and approved by the local ethics committee.

Measures

Life Goals. Life goals were assessed using the GOALS questionnaire (Pöhlmann & Brunstein, 1997). This measure evaluates individual life goals pertaining to the domains of achievement, power, affiliation, intimacy, altruism and variation along goal attributes revealing importance, attainability, and success. We used a shortened questionnaire that only assessed the importance and the success of life goals in the four motive-relevant domains (achievement, power, affiliation, and intimacy) to reduce the subject burden. Success of goal striving will not be analyzed in this study because it does not pertain to our research question. The individual importance of achievement goals (e.g., I want to improve my education continuously), power goals (e.g., I want to have a high social status), affiliation goals (e.g., I want to spend a lot of time with others) and intimacy goals (e.g., I want to have a close relationship), respectively, was evaluated with a total of 12 items on a 5-point Likert scale ranging from 1 (*not important*) to 5 (*very important*). The mean scores for achievement, power, affiliation and intimacy goals were calculated for further analyses. Table 12 presents the descriptive statistics and the intercorrelations of these scores.

Table 12

Descriptive Statistics and Two-Tailed Correlations

Variable	*Goal*Ach	*Goal*Pow	*Goal*Aff	*Goal*Int	*n*Ach	*n*Pow	*n*Aff	*n*Int	Women[a]		Men[a]	
									M	*SD*	*M*	*SD*
*Goal*Ach	-	.36 **	.12 *	.36 **	-.03	-.02	-.14 **	-.04	4.02	0.74	4.01	0.73
*Goal*Pow	.27 **	-	.36 **	.10 *	-.02	.03	-.08	.01	2.53	0.89	2.81	0.91
GoalAff	.27 **	.42 **	-	.23 **	-.06	.05	-.01	.06	3.35	0.91	3.08	0.87
GoalInt	.47 **	.21 **	.27 **	-	-.03	-.12 *	.07	.08	4.63	0.49	4.35	0.58
*n*Ach	.05	.01	.04	.00	-	.12 *	-.03	.05	1.53	1.30	1.55	1.40
nPow	.01	-.03	.01	.06	.05	-	-.14 **	-.09	1.92	1.72	1.96	1.57
nAff	.08	.08	.11 *	.09	.13 *	-.04	-	.51 **	3.86	1.97	3.02	1.74
*n*Int	.07	.03	.10	.15 **	.12 *	-.06	.51 **	-	4.05	2.73	3.07	2.59

Note. Correlations are computed with stereotype corrected goals and motive scores. Correlations of the women (N = 367) are represented above the diagonal, correlations of the men (N = 368) are represented below the diagonal. *Goal*Ach = Achievement Goal; *Goal*Pow = Power Goal; *Goal*Aff = Affiliation Goal; *Goal*Int = Intimacy Goal; *n*Ach = Implicit Achievement Motive; *n*Pow = Implicit Power Motive; *nAff* = Implicit Affiliation Motive; *nInt* = Implicit Intimacy Motive.

[a] The descriptive statistics for women and men are calculated with the raw goals and motives scores.

** $p < .01$. * $p < .05$.

Implicit Motives. Implicit motives were assessed using the Picture Story Exercise (PSE; McClelland et al., 1989; Schultheiss & Pang, 2007). The PSE is a measurement in which participants write imaginative stories corresponding to a set of pictures. The rationale behind this is that the different picture cues activate individual implicit motives, which are subsequently expressed in the contents of the written stories.

Participants were provided with the standardized written introduction proposed by Pang (2010). The introduction advises the participants to write a short fantasy-based story about each of the following six pictures[8]: (1) ship captain, (2) woman in laboratory, (3) nightclub scene, (4) trapeze artists, (5) architect at desk, and (6) couple by river (Schultheiss & Brunstein, 2001). Participants were instructed to write an imaginative story about the feelings, thoughts and wishes of the persons depicted on each picture right after the presentation of the respective picture. They were provided with a set of questions to guide their stories, for instance, "What is happening right now?", "Who are the persons depicted?" and "What feelings and thoughts do they express?" Participants had four minutes to write each story. The experimenter reminded them to finish their writing thirty seconds before the end of the time. Afterwards the experimenter instructed them to proceed with the next picture. These steps were repeated for all of the six pictures.

Four independent coders scored each story for motive-specific content (achievement, power, and affiliation) following Winter's (1994) *Manual for scoring motive imagery in running text*. The coders were certified for scoring motive imagery in running texts, and calibrated on an expert coding set in advance. In addition, they reached an overall agreement of Cohen's Kappa at a minimum of 0.80 on the stories of 51 participants before they started independently coding the imaginative stories. Couples were randomly assigned to the coders, who scored all stories of the respective couple and were blind to the age and the gender of the spouses. The coders periodically discussed equivocal scoring cases. Two intensively trained and independent coders separately scored the intimacy motive following the coding manual by McAdams (1980). They attained an overall agreement of Cohen's Kappa at a minimum of .85 on the stories of 16 participants before they scored the imaginative stories separately. *Achievement* was coded whenever a story character evaluated achievement in a positive way, referred to goals or performance with a positive outcome, depicted victory, defeat or competition, worried about failure, or described a unique and extraordinary accomplishment.

[8] These picture cues correspond to the standardized picture cue set used by Schultheiss and Brunstein (2001). We selected these picture cues because they have a high pull for different implicit motives and thus maximize the variance of the measurement.

Power was coded when a character acted in a strong or powerful way that affected other persons, wanted to control, influence or impress others, helped other individuals without being asked, or elicited strong emotions in others. *Affiliation* was scored when a character in the story displayed positive, friendly, or intimate feelings towards another person, was sad about separation or wanted to re-establish a relationship, performed activities in the context of affiliation, or supported other persons through emphasizing or generous behavior. *Intimacy* was scored when a relationship was mentioned that produced positive affect or a dialog. In this case, the story was examined in detail for various subcategories: psychological growth and coping, commitment or concern, time and space, union, harmony, surrender, escape to intimacy, or connections with the outside world.

We aggregated all codings for one motive across all six stories to obtain a motive score for each person. Because the protocol length was significantly correlated with motive scores (r = .29 to .49; p < .01), we corrected the scores following standard procedures using regression analyses (Pang, 2010). We converted the resulting residuals to z scores for further analyses. Table 12 shows the descriptive statistics of the raw motive scores for women and men and the two-tailed Pearson correlations between the corrected motive scores.

Results

Data Analysis Plan

We calculated difference scores[9] to draw conclusions about the similarity between the two partners in terms of their life goals and implicit motives. We used the individual scores of women and men to calculate absolute difference scores for goals and implicit motives in the domains of achievement, power, affiliation, and intimacy. Thus, scores close to zero stand for similarity. The further scores deviate from zero, the more dissimilar partners are. A general issue when calculating similarity scores is the stereotype bias (Kenny et al., 2006; Acitelli et al., 2001): Women and men tend to respond to the measurement of various variables in a stereotypical fashion. For example, both women and men tend to indicate high intimacy goals in the context of a relationship study (M_{women} = 4.6; M_{men} = 4.4; range: 2.5-5). Thus, it is possible that difference scores indicate an apparent similarity because of shared stereotypical

[9] In recent years, the use of difference scores has been criticized. Critiques were usually directed to individual change scores, difference scores as independent variables, and difference scores of variables assessed with unreliable measurements (e.g., Cohen, Cohen, West, and Aiken, 2003). These problems do not apply to our study. Besides, we were not interested in difference scores at an individual level (e.g., change scores), but at a dyadic level. We were interested in explaining the mere difference between two partners itself (also called: level difference). Researchers involved in dyadic data analyses even recommend the use of difference scores for such analyses (e.g., Kenny, Kashy, and Cook, 2006).

judgements rather than because of an actual similarity between the two partners in the relationship, resulting in ceiling effects. Kenny et al. (2006) recommend subtracting the respective mean score from the individual scores to control for these normative responses before calculating the difference scores. We followed this recommendation. The resulting difference scores therefore express the dissimilarity of the partners without any bias.

We used regression analyses to investigate the cross-sectional relationship between relationship duration and the respective difference scores. Relationship duration was transformed using the natural logarithm ($\ln(x)$)[10]. Because the logarithm squashes the right tail of the distribution, this transformation reflects the relationship duration as probably perceived by the spouses (e.g., couples who have been together for just one year experience a relationship duration of one year much longer than couples who have been together for about 60 years). We used relationship duration as predictor variable and the difference scores of goals and implicit motives as outcome variables. In addition, we examined the data by estimating Bayes factors. These analyses compare the fit of the data based on the null hypothesis (no relationship between relationship duration and the similarity score) with the fit of the data based on the alternative hypothesis (existing relationship between relationship duration and the similarity score). The results of the Bayes analyses indicate whether the data are more probably in favor of the null hypothesis or more probably in favor of the alternative hypothesis (Jarosz & Wiley, 2014). We used the default Cauchy prior distribution with a scale parameter of 0.5 to model the alternative hypothesis. All cross-sectional regression and Bayesian analyses were conducted using the statistical software JASP (JASP Team, 2016).

To investigate the longitudinal relationship between relationship duration and similarity in life goals, we calculated random intercept multilevel models. These models allow for controlling the dependence of the different measurement points of the particular couples according to their hierarchical structure. We used the difference scores as dependent variables, and relationship duration, the measurement point (coded as 0 = first measurement, 1 = second measurement, 2 = third measurement) and the interaction (product term) of relationship duration and measurement point as independent variables. The longitudinal analyses were conducted with the lme4-package of the statistical software R (Bates, Mächler, Bolker, & Walker, 2015; R Core Team, 2015).

[10] Analyses using bias-corrected difference scores as the dependent variable and relationship duration that was not log-transformed as independent variables led to comparable results.

Analyses of the Similarity in Life Goals and the Similarity in Implicit Motives

In a first step, we analyzed whether spouses are similar regarding their goals and whether they are similar regarding their implicit motives while keeping their relationship duration constant. These analyses examine the similarity of spouses in their motivational variables regardless of relationship duration, and allow us to draw some initial conclusions regarding assortative mating effects. Women's bias-corrected goal scores were regressed on men's bias-corrected goal scores controlling for relationship duration. We did the same analysis with the respective implicit motive scores. Table 13 shows the results of these analyses. Men's goals significantly predicted respective women's goals (achievement: $\beta = 0.27$, $SE = 0.05$, $t(365) = 5.37$, $p < .001$; power: $\beta = 0.24$, $SE = 0.05$, $t(365) = 4.83$, $p < .001$; affiliation: $\beta = 0.13$, $SE = 0.06$, $t(365) = 2.55$, $p = .01$; intimacy: $\beta = 0.20$, $SE = 0.04$, $t(365) = 3.82$, $p < .001$), indicating a similarity of partners in all goal domains. Regarding implicit motives, only men's implicit achievement motives predicted women's implicit achievement motives to a noticeably smaller extent ($\beta = 0.14$, $SE = 0.05$, $t(366) = 2.59$, $p < .01$) than it was the case for most of the goal domains (achievement, power, and intimacy). There was no significant relationship between women's and men's implicit motives in the other domains (power: $\beta = 0.04$, $SE = 0.05$, $t(366) = 0.69$, $p = .49$; affiliation: $\beta = 0.08$, $SE = 0.06$, $t(366) = 1.44$, $p = .15$; intimacy: $\beta = 0.05$, $SE = 0.05$, $t(366) = 0.91$, $p = .36$), indicating a small to negligible similarity between spouses in terms of their implicit motives.

Table 13

Regression Analyses of Spousal Similarity in Goals and Implicit Motives

	Women's scores				
Men's scores	*B*	*SE B*	β	*t*	*p*
Goals					
Achievement	.275	0.051	.270	5.366	< .001
Power	.239	0.050	.244	4.827	< .001
Affiliation	.140	0.055	.133	2.546	0.011
Intimacy	.155	0.041	.199	3.824	< .001
Implicit motives					
Achievement	.135	0.052	.135	2.592	0.010
Power	.036	0.053	.036	0.693	0.489
Affiliation	.076	0.053	.076	1.440	0.151
Intimacy	.048	0.053	.048	0.911	0.363

Note. Implicit motive scores are residualized on number of words. The scores are a result of the bias correction (raw score – mean score). All analyses are controlled for relationship duration.

In a second step, we investigated whether the relationship duration significantly relates to the spouses' difference scores for life goals (cross-sectionally and longitudinally) and implicit motives (cross-sectionally). These analyses examine whether or not spouses are more similar in terms of their motivational variables the longer their relationship duration is.

Further, we analyzed these relationships using the profile similarity to cover common analytical methods. Whereas difference scores determine the distance between spouses on the level (mean), this index for dyadic similarity represents the similarity in the shape (e.g., the ups and downs) of multiple items. We estimated the profile similarity by correlating one partner's rating of the four motive/goal domains (power, achievement, affiliation, intimacy) with the other partner's rating of the four motive/goal domains. Analyses did not yield any significant result. We do not further address this issue because the similarity in the shape of all motive/goal domains is not part of our research question.

Life goals. Table 14 shows positive and significant relationships between the stereotype-corrected difference scores for achievement and intimacy goals and the log-transformed relationship duration (achievement: $\beta = .15$, $t(365) = 2.83$, $p < .01$; intimacy: $\beta = .15$, $t(365) = 2.97$, $p < .01$). The relationship between the bias-corrected difference score of the power and affiliation goals and the log-transformed relationship duration was not significant (power: $\beta = .06$, $t(365) = 1.17$, $p = .24$; affiliation: $\beta = .03$, $t(365) = 0.63$, $p = .53$). The significant relationships indicate that spouses become dissimilar in their achievement and in their intimacy goals with increasing duration of their relationship. Estimated Bayes factors (Achievement: $BF_{10} = 5.32$; Intimacy: $BF_{10} = 7.72$) suggested that the data were 5.3 and 7.7 times more likely to occur under the alternative hypothesis than under the null hypothesis.

Table 14

Cross-sectional Analyses of the Influence of Relationship Duration on the Similarity in Life Goals

	Difference scores (bias corrected)							
Goals	*B*	*SE B*	β	*t*	*p*	*BF*	95% CI	
							Lower bound	Upper bound
Achievement	.067	0.024	.147	2.833	0.005	5.32	.020	.113
Power	.036	0.031	.061	1.173	0.242	0.22	-.024	.096
Affiliation	.021	0.033	.033	0.627	0.531	0.14	-.044	.085
Intimacy	.053	0.018	.154	2.968	0.003	7.72	.018	.088

Note. The scores are a result of the stereotype correction (raw score – mean score). Relationship duration was log-transformed (e).

Furthermore, we calculated random intercept multilevel models to investigate the longitudinal effects of relationship duration on spouses' difference scores for life goals in the domains of achievement, power, affiliation and intimacy. Table 15 shows the results of the longitudinal analyses over a period of three years. Neither the effects of measurement point (Time) nor the effects of the interaction terms of measurement point and relationship length on the difference scores of all four life goals became significant. These results indicate that there is no change in life goals over the period of three years. However, despite the non-significant longitudinal results, the above-mentioned cross-sectional Bayesian analyses showed a strong negative relationship between achievement and intimacy goals and relationship duration.

Table 15

Longitudinal Analyses of Difference Scores in Life Goals

Model	**Achievement**	**Power**	**Affiliation**	**Intimacy**
Fixed part	Coefficient (s.e)	Coefficient (s.e)	Coefficient (s.e)	Coefficient (s.e)
Intercept	0.52 (0.08)***	0.89 (0.11)***	0.86 (0.12)***	0.33 (0.06)***
Time	0.04 (0.05)	0.05 (0.06)	0.01 (0.06)	0.06 (0.04)
Rel. Duration	0.05 (0.03)	0.00 (0.04)	0.02 (0.04)	0.06 (0.02)**
Time*Duration	- 0.02 (0.02)	- 0.02 (0.02)	- 0.01 (0.02)	- 0.02 (0.01)
Random part[a]				
σ^2_e	0.13	0.22	0.22	0.10
σ^2_{u0}	0.13	0.31	0.36	0.07
σ^2_{u1}	0.02	0.03	0.00	0.00

Note. [a] for simplicity, the covariances have not been included.
The scores are a result of the bias correction (raw score – mean score). The relationship duration was log-transformed. Time is coded as 0 = measurement point 1, 1 = measurement point 2, 2 = measurement point 3. Relationship duration is coded as 0 = one year (range: 0 – 59 years).
Models are calculated using the Satterthwaite approximation for degrees of freedom.
*** $p < .001$. ** $p < .01$.

Implicit motives. Table 16 shows that the relationship between the log-transformed relationship duration and bias-corrected difference scores of implicit achievement motives ($\beta = -.15$, $t(366) = -2.92$, $p < .01$), implicit power motives ($\beta = -.11$, $t(366) = -2.16$, $p < .05$), implicit affiliation motives ($\beta = -.11$, $t(366) = -2.07$, $p < .05$), and implicit intimacy motives ($\beta = -.16$, $t(366) = -3.17$, $p < .01$) was negative and significant. These significant results indicate that spouses are more similar in their implicit motives the longer their relationship lasts. Estimated Bayes factors (Achievement: $BF_{10} = 6.67$; Power: $BF_{10} = 1.08$; Affiliation: $BF_{10} = 0.90$; Intimacy: $BF_{10} = 13.90$) suggested that the data regarding achievement and intimacy were 6.67 and 13.90 times more likely to occur under the alternative hypotheses, indicating moderate (achievement motives) to strong (intimacy motives) support for the alternative hypotheses (Jeffreys, 1961; Lee & Wagenmakers, 2013). However, they also

suggest interpreting the results regarding the implicit power and affiliation motives with caution.

Table 16

Cross-sectional Analyses of the Influence of Relationship Duration on the Similarity in Implicit Motives

	Difference scores (bias corrected)							
Implicit motives	*B*	*SE B*	β	*t*	*p*	*BF*	95% CI	
							Lower bound	Upper bound
Achievement	-.104	0.036	-.151	-2.916	0.004	6.67	-.175	-.034
Power	-.085	0.039	-.112	-2.163	0.031	1.08	-.162	-.008
Affiliation	-.074	0.036	-.108	-2.068	0.039	0.90	-.145	-.004
Intimacy	-.125	0.040	-.164	-3.172	0.002	13.90	-.203	-.048

Note. Implicit motive scores are residualized on number of words. The scores are a result of the stereotype correction (raw score – mean score). Relationship duration was log-transformed (e).

Discussion

The objective of this study was to answer two questions: First, whether there is a similarity between partners regarding their life goals as well as a similarity regarding their implicit motives and, second, whether relationship duration relates to spouses' similarity in these variables. We assumed that individuals choose a partner who is similar in the life goals at the beginning of their relationship, while spouses converge to each other in their implicit motives as they get better acquainted with each other. In a first step, we analyzed the relationship between the partners' scores for life goals as well as for implicit motives controlling for relationship duration. According to our hypotheses, we expected a strong relationship between women's and men's life goals and a weak relationship between women's and men's implicit motives. The results of these analyses provide strong support for this proposition. Men's life goals in the domains of achievement, power, affiliation, and intimacy significantly predicted respective women's goals, whereas these relationships concerning motives were only significant regarding the implicit achievement motive. These results give first evidence that spouses are more similar to each other regarding their life goals than regarding their implicit motives when relationship duration is controlled for. In a second step, we analyzed the association between relationship duration and spouses' similarity in life goals as well as in implicit motives. Due to a high initial similarity in life goals on the one hand and increasing shared activities of partners, resulting in convergence effects in implicit motives on the other hand, we expected a weak positive linkage between relationship duration and the spouses' similarity concerning life goals but a strong positive association between relationship

duration and spouses' similarity in implicit motives. The results of this analysis yield partial support for this assumption. Partners do not converge towards each other in their life goals. Instead, there is evidence that partners even become somewhat dissimilar to each other in their achievement and intimacy goals. Further longitudinal and Bayesian analyses indicate that there is no change in life goals over a three-year period but a high likelihood that relationship duration has a negative relation to the similarity of spouses concerning their achievement and their intimacy goals. A significant association between relationship duration and the similarity score of spouses in their implicit motives indicates that spouses converge towards each other in their implicit motives during the course of their relationship. All of these findings will be discussed in the following section.

Similarity in Life Goals

We assumed that life goals are self-attributed opinions about one's own goals that are voluntarily or involuntarily communicated to others, in other words, visible characteristics. Given the importance of goals for shaping one's life (Pöhlmann & Brunstein, 1997), it seems plausible that individuals tend to choose a partner according to a high similarity in life goals. Assortative mating might lead to high initial similarity scores in partners' life goals. Therefore, it is hardly surprising that spouses do not become even more similar in their life goals over the course of their relationship. However, it is also possible that convergence effects in the similarity of life goals took place during the first year of the relationship and stabilized thereafter. Although some research indicates that the life goals of an individual are correctly and very quickly recognized by peers (McClelland, 1972a; Jackson, 1974), it is possible that the communication and perception of life goals takes longer than the first few minutes of the first meeting, as considered by researchers investigating assortative mating effects (e.g., Bahns, Crandall, Gillath, & Preacher, 2016). During the phase of getting to know each other in the first months of a relationship, partners may exchange opinions about their individual life goals. This exchange process could already lead to convergence effects in spouses' life goals or discontinuation of the relationship. Our study only investigated couples who had been in an intimate relationship with each other for at least one year. We cannot rule out that convergence effects happened or that too dissimilar spouses already separated within the first year of the relationship. It will be interesting to investigate in future studies if and when convergence effects happen regarding life goals. Our study shows that after a year partners are similar in their life goals. Because we think that life goals are highly visible

characteristics of an individual and we have no data on the first 12 months of the relationship for detecting early convergence effects, we have to assume that assortative mating took place.

Besides, it would be very interesting to investigate if assortative mating effects are dependent on mating partners' current stage of life. For example, individuals who are in an earlier stage of life that favors more individualistic concerns might be less interested to find a similar mating partner. Unfortunately we cannot make any conclusions about this question because we did not recruit couples according to their life stages. Further, we do not have any data that reflect individual's current stage of life. This could be an interesting question for further research.

In addition, it could be another interesting question for subsequent research how goals of different levels of abstraction are considered in the mating process and how they change during the course of a relationship. Whereas life goals are very abstract and act as meaningful and superordinate goals with a long time perspective, other goals, such as personal projects or life tasks, are less abstract, less meaningful and often oriented towards a shorter time perspective. Presumably, the latter goals are perceived differently in the partner selection process and change in different ways over the course of a relationship than life goals. We assumed that partners choose each other according to a similarity in their life goals because these goals are, as a part of the self-concept, very meaningful and visible to the self and others. Goals of a lower level of abstraction might be equally visibly, but more specific, rather substitutable and less meaningful. Thus, mating partners might not give special importance to a similarity in these goals at the beginning of their relationship. It would be interesting to study in future research whether indeed personal projects are less important in partner selection processes than life goals or whether they are more important than we speculate here. Similar processes might occur over the course of a relationship. Goals of a lower abstraction level are mainly short-term subordinate goals that are assigned to higher-order goals such as life goals (Austin & Vancouver, 1996). They are less meaningful because, in theory, they can be substituted with equivalent goals. Thus, partners might be more willing to adapt their short-term goals to the goals of the partner (for a similar and detailed discussion about goal dependency see: Fitzsimons et al., 2015). Again, if this is actually the case, remains to be tested empirically. In sum, it is likely that goal properties such as abstraction, temporal distance, and meaningfulness, influence how these goals are considered by the partners at the beginning of a relationship and how they change during the relationship. We investigated

these processes regarding life goals. It is up to further research to analyze assortative mating and convergence effects regarding goals with other properties (e.g., personal projects).

Our cross-sectional results indicate that couples become dissimilar in their achievement and intimacy goals with increasing relationship duration. Given that there is no longitudinal change in these goals over a three-year period, we assume that these results might be due to a functional adaption process of spousal goal setting over the course of the relationship. Presumably, it is more functional for the coordination within a family to split up the pursuit of these goals and to support each other in pursuing different goals. This assumption is supported by the Transactive Goal Dynamics model. It suggests that goal processes, especially in couples, are social and that goal setting and pursuit is highly dependent on the partner (Fitzsimons et al., 2015). Presumably, this interdependence increases when partners are better acquainted to each other.

However, our results might not only be due to a functional adaption process in the relationship but also to cohort effects regarding the understanding of spouses' roles. This might influence the goal setting of spouses. Older couples might have a more traditional understanding of roles than younger couples. Whereas younger spouses might both pursue their goals more individually, the goals of older spouses might be more dependent on each other. The traditional gender roles suggest that the husband is the sole breadwinner of the family and the wife is responsible for the social life in the family. This might influence how both partners consciously set their respective and shared goals. When a husband focuses strongly on achievement goals (e.g., to earn more money), his wife focuses on intimacy goals and abstains from forming achievement goals. This might end up in a high dissimilarity in these two goal areas within a couple.

Convergence in Implicit Motives

We assumed that implicit motives are covert, in other words, invisible characteristics. They are mostly not even discernible by introspection and, consequently, not directly discernible by others. Therefore, it does not seem plausible to assume assortative mating effects in implicit motives. Our results provide some initial evidence of this. We found only a relationship between partners' achievement motive scores and no relationship between partners' motive scores in the domains of power, affiliation, and intimacy when we controlled for relationship duration. The significant similarity in implicit achievement motives might be due to a homogenous mating environment. For example, many spouses meet each other for

the first time in the working environment or when doing sports. According to the literature on implicit motives, individuals should be drawn to environments that offer incentives that satisfy their motives, in other words, to jobs or sports that match with the individual level of their achievement motive. Consequently, homogenous mating environments might be a pathway to a similarity of spouses in their implicit achievement motives.

We also assumed that shared activities and affective experiences of spouses may indirectly cause convergence effects in implicit motives with increasing relationship duration. Our results provided evidence for these convergence effects in implicit motives. Spouses are more similar to each other in their implicit motives the longer they have been together.

However, from a theoretical perspective it could be argued that spouses should actually become dissimilar in their implicit power motives over time, because a similarity in power motives might have detrimental effects on the functioning of a relationship. Interpersonal circumplex theories highlight the importance of complementarity in contrast to similarity with regard to dominance. They assume beneficial effects for a relationship or an interaction when partners are opposite on specific dimensions (Carson, 1969). For example, researchers suggest that "a person who is somewhat dominant might enjoy continuously interacting with a submissive romantic partner because he or she allows this person the ability to maintain his or her preferred style of behavior" (Markey & Markey, 2007, p. 530). Research evidenced that this complementarity in dominance predicted the highest levels of love and harmony in romantic dyads (Markey & Markey, 2007). Consequently, it is reasonable to presume that individuals with high implicit power motives might prefer partners with low implicit power motives. However, research has also found that individuals actually prefer and choose mating partners who are similar to themselves (Botwin, Buss, & Shackelford, 1997). Presumably, individuals high in implicit power motives prefer an active and dynamic lifestyle and might tend to choose partners who share this lifestyle. As mentioned above, shared activities, and thus a shared lifestyle, is assumed to be beneficial for relationships (Fitzsimons et al., 2015) and may indirectly cause convergence effects in implicit motives with increasing relationship duration. Our study shows that spouses become more similar to each other in their implicit motives over time. Whether this has detrimental effects on the relationship we cannot answer. It is up to future studies to investigate the effects of similarity of implicit motives on relationship satisfaction. It is likely that implicit motives change slightly over time or depending on specific situational factors, as has been shown by previous research (e.g., Franz, 1994; McClelland & Winter, 1969; Veroff et al., 1984).

However, it is implausible that they vanish or change entirely over time because they are individual characteristics similar to personality traits (McClelland, 1980). Besides, in contrast to the conscious goals, unconscious implicit motives are not cognitively accessible and controllable. We therefore assume that it is unlikely that an individual with high implicit power motives will be able to change these motives to more submissive motives. However, the Bayesian analysis suggests that the significant results for the implicit power motive should be interpreted with caution. This might be one indication that the effect of similarity in the implicit power motive is not very strong and even might have detrimental effects for some couples.

In addition, the Bayesian analyses also show that the significant effects of the implicit affiliation motive are not very strong. This might be due to two reasons: First, the implicit affiliation motive reflects the tendency to seek companion with anyone, even strangers. Therefore, this implicit motive might not be as relevant for an intimate relationship as the intimacy motive. Second, the small effects might be explained by a strong avoidance focus in the coding of the implicit affiliation motive. Researchers noticed that the implicit affiliation motive "is best conceived as a measure of affiliative anxiety or fear of rejection" (Koestner & McClelland, 1992, p. 210). In view of that, it seems comprehensible that a motive, driven by the fear of rejection, is not related to an approach behavior such as getting similar to each other.

It is possible, however, that the convergence effects in implicit motives we found are due to age effects. The results supporting these convergence effects are based on cross-sectional analyses. Unfortunately it is not possible to control for age effects with our data set, because age and relationship duration are highly correlated (women: $r = .88$, $p = .00$; men: $r = .87$, $p = .00$). However, if age itself changes implicit motives, implicit motive scores of both partners should change to a similar degree. There is no plausible argument to assume gender differences in age-related change of implicit motives. Therefore, the change in women's motives should be the same as that in men's motives. Consequently, our discrepancy score for measuring the (dis)similarity should not be affected by a potential age effect. Nevertheless, future studies should investigate the convergence effects of implicit motives using a longitudinal design following spouses (and their motives) through their relationships. Another way to overcome potential age effects is to conduct a study with aged couples who have only been together for a short period of time. Our data set includes such couples, but

unfortunately not enough to analyze them (only five of 121 couples between 65-80 years with a relationship duration less than 10 years).

At first glance one might presume that a change of spousal similarity in life goals and implicit motives is associated with a change in the congruence of goals and implicit motives on the individual level. Motive-goal congruence is a well investigated construct reflecting the match between conscious goals and unconscious implicit motives of a person. Researchers already demonstrated positive effects of motive-goal congruence on subjective well-being on the individual level (e.g., Brunstein et al., 1998). Thus, it could be assumed that motive-goal congruence on the individual level might influence relationship satisfaction positively (e.g., Hagemeyer et al., 2013) and might be related to the similarity of spouses in their goals and implicit motives. In fact, concluding from spouses' similarity in life goals and spouses' similarity in implicit motives on individual motive-goal congruence (or vice versa) is very speculative. Even if both partners are similar to each other in their life goals and in their implicit motives, respectively, this does not necessarily imply that one partner's life goals and implicit motives are congruent. The similarity score only says something about the distance between the two partners on the respective variable but not about the actual values. For example, spouses can be very similar to each other in their intimacy goals as well as in their implicit intimacy motives, but their score on intimacy goals can be very low while it is very high on the implicit intimacy motive at the same time, resulting in a low motive-goal congruence for both partners at the individual level.

However, this article addresses just a small part of possible analyses. We separately investigated partners' life goals and implicit motives on a dyadic level. We have not conducted any analyses on the motive-goal congruence on an individual level because this would go beyond the scope of our research question. However, a detailed analysis of the association between motive-goal congruence and spousal similarity in these motivational variables may be an interesting topic for future research. Nevertheless, our results have implications for further research that longitudinally investigates individual motive-goal congruence: In such analyses the influence of relationships on motivational variables and, consequently, on the congruence of these variables should be taken into account.

Furthermore, we want to point to a methodological limitation: The above mentioned results emerged mainly according to cross-sectional analyses in a single dataset. As above mentioned, these results could also be due to cohort and age effects. Though we discussed these alternative interpretations, we cannot rule out that they caused these results. Although

this extensive dataset has a high power to predict reliable results and longitudinal and Bayesian analyses were integrated wherever possible to confirm the results, further replications of these findings are needed.

Summary

The present study extends existing research on similarity of romantic partners by investigating the dyadic similarity of fundamental motivational constructs and the influence of relationship duration on the similarity. We assumed that life goals are conscious entities that are also communicated to interaction partners. Hence, spouses can choose each other according to a similarity in their life goals. Due to an initially high similarity in these goals, partners may not become more similar regarding their life goals over the course of their relationship. However, they even become dissimilar in specific goal domains. Additionally, we assumed that implicit motives are unconscious needs that are not discernible by others. Therefore, assortative mating is not possible and spouses' relationship duration might significantly contribute to the similarity in implicit motives. Our results supported these assumptions and showed a positive relation between relationship duration and spouses' similarity in implicit motives. In short, according to our data, there are assortative mating effects in life goals, whereas there are convergence effects in implicit motives. To come back to the metaphor of the t-shirt with the Asian-English slogan mentioned at the beginning: According to our study the front of the t-shirt stating "same same" symbolizes the life goals that are probably discernible during the phase of getting to know each other. They are visible for potential partners and similarity in, for example life goals, seems to be one determining factor for the mating decision. The back of the t-shirt with the words "but different" is less obvious and symbolizes the similarity in implicit motives. This phrase goes unnoticed at first and in many cases the two partners do not recognize it until they have known each other for a long time. Accordingly, spouses' implicit motives are different at the beginning of a relationship because they are "invisible" and not prone to assortative mating. Instead, they become more similar as the relationship progresses because of shared experiences and environments that reinforce the same motives.

Part IV:

Behavioral Outcomes of High Similarity in Implicit Motives

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This manuscript has been prepared for submission with the following title:

"Sway to the Rhythm of Love: The Relationship Between the Need for Intimacy and the Nonverbal Synchrony in Couple Interactions"

Abstract

Intimate relationships provide a framework that allows individuals to express and fulfill specific fundamental needs, such as the need for intimacy. We assume that a high need for intimacy results in well-coordinated nonverbal movements in a dyadic conflict discussion because the synchronization of movements seems to have a functional character to establish intimacy. We investigated this relationship as well as the consequences on relationship quality with response surface analyses and dyadic structural equation modelling within a community sample of 334 heterosexual couples. Contrary to the assumptions, interaction partners, who are both high in their need for intimacy, are not well-synchronized in their movements. This solely applies to couples with only one partner high in the need for intimacy, highlighting the functional character of nonverbal synchrony to compensate the missing match in the need for intimacy. In this constellation, nonverbal synchrony is also positively related to relationship quality.

Introduction

Originally, this article was entitled: “Sway to the Rhythm of Love: The Relationship Between the Need for Intimacy and the Nonverbal Synchrony in Couple Interactions”. The first part of this title, “Sway to the rhythm of love”, is a metaphor that brings up the idea that spouses’ needs for intimacy affect how couples coordinate the rhythm of their movements in dyadic interactions. This article addresses the research question how the constellations in the need for intimacy of two romantic partners (e.g., one partner high, the other partner low in the need for intimacy) are associated to their synchrony of nonverbal behavior in a dyadic conversation.

The Need for Intimacy in Intimate Relationships

Individuals spend plenty of time in relationships that are often characterized by a high level of intimacy. This contains components such as a high mutual disclosure of personal information, positive feelings toward the partner, as well as verbal and nonverbal communication of affection (Baumeister, 1999) and seems to be crucial for a healthy relationship. Research already confirmed the positive influence of intimacy on physiological and psychological health as well as relationship satisfaction (for an overview see: Kenny & Acitelli, 1994; Stadler, Snyder, Horn, Shrout, & Bolger, 2012). The motivational disposition to strive for intimacy seems to be a key component for the togetherness of couples because intimate relationships, especially dyadic interactions between spouses, provide a framework that allows individuals to express and fulfill specific fundamental desires, such as the need for intimacy (e.g., Cantor & Malley, 1991). This need differs interindividual in its intensity and “is defined as a recurrent preference or readiness for experiences of warm, close, and communicative interaction with others” (McAdams & Bryant, 1987, p. 397). This disposition is also called the implicit intimacy motive. In short, the “intimacy motivation is the capacity to love and to be loved” (McClelland, 1985, p. 365). Research even documented that individuals high in the need for intimacy experience more positive affective feelings in the interaction with others (McAdams & Constantian, 1983), as well as higher relationship satisfaction than individuals low in the need for intimacy (Hagemeyer & Neyer, 2012; McAdams & Vaillant, 1982).

Besides, this mostly unconscious personality disposition energizes, directs, and selects behavior in specific situations (McClelland, 1985). Such situations are, for example, dyadic interactions and conversations because they allow motivated and goal-oriented behavior (e.g., behavior to establish intimacy; Horowitz et al., 2006). Needs automatically control the

perception and interpretation of specific events in such situations (Cantor & Malley, 1991) and unconsciously activate action plans and behavioral strategies for goal attainment and need fulfillment (Aarts & Dijksterhuis, 2000). Thus, the individual need for intimacy might exert a decisive influence on dyadic interactions and conversations. Several studies documented the relationship between the need for intimacy and behavior in dyadic interactions and provided evidence that the need for intimacy is related to interpersonal behavior that produces harmony and conviviality (e.g., McAdams & Powers, 1981; McAdams & Bryant, 1987; McAdams & Vaillant, 1982). For example, individuals high in the need for intimacy showed more trust and self-disclosure, more concern for the well-being of friends and more listening to interlocutors than individuals low in this need (McAdams, Healy et al., 1984). Besides, intimacy motivated individuals are extremely skilled to recognize needs and wants as well as subtle affective changes of interaction partners and they are able to react adequately on it (Cantor & Malley, 1991). In sum, the investigation of intimacy motivation in dyadic interactions and conversations seems to be very important because these situations are a central domain in which the need for intimacy is expressed.

Researchers assume that these needs are activated through operant and nonverbal cues of the environment and, therefore, primarily manifest on the nonverbal level of a communication (for an overview see: Schultheiss, 2008). This assumption has also been made concerning the construct of intimacy (Prager, 2000). Researchers concluded „that nonverbal communication is intimacy's primary vehicle" (Andersen, Guerrero, & Jones, 2006, p. 260). Consequently, a high need for intimacy directly influences the nonverbal communication in a conversation. For example, there is empirical evidence that a high need for intimacy increases the physical proximity to interlocutors (McAdams & Powers, 1981) and affects interpersonal behavior such as smiling, laughing and eye contact (Hagemeyer et al., 2016; McAdams, Jackson et al., 1984).

Additionally, there is first evidence that such motivational dispositions affect not only specific nonverbal behavior, such as smiling and eye contact, but also the interpersonal coordination of nonverbal behavior (Lakin & Chartrand, 2003). Research provided initial evidence that interaction partners unconsciously synchronize their body movements more often when they wish to establish a positive relationship to each other (Miles et al., 2011; LaFrance & Ickes, 1981; Lakin & Chartrand, 2003; Stel et al., 2010). The authors assumed that the interpersonal coordination of nonverbal behavior could have a functional purpose in

social and dyadic interactions. Interaction partners might use it unconsciously to attain specific goals and needs (e.g., to establish a positive and intimate relationship).

Interpersonal Coordination of Nonverbal Behavior

Bernieri and Rosenthal (1991) define interpersonal coordination as "the degree to which the behaviors in an interaction are nonrandom, patterned, or synchronized in both timing and form" (Bernieri & Rosenthal, 1991, p. 403). They distinguish between two types of interpersonal coordination: behavioral matching and interpersonal synchrony. Behavioral matching is characterized as the, mostly unconscious, imitation of the posture or specific bodily movements of others (e.g., gestures, head nodding). There is already a lot of research that investigated this topic using terms such as "chameleon effect" (Chartrand & Bargh, 1999), "mimicry" (Guéguen & Martin, 2009; LaFrance, 1979; Lakin & Chartrand, 2003; Stel et al., 2010), or "mirroring" (LaFrance, 1982).

The "interactional synchrony is defined as the degree of congruence between the behavioral cycles of two or more people" (Bernieri & Rosenthal, 1991, p. 411) and "can be viewed as the metronome to which human communication is set" (Burgoon, Stern, & Dillman, 1995, p. 20). Interactional synchrony indicates the congruence of the rhythm and the coordination of behavior in interpersonal communication situations but not necessarily the similarity of specific behaviors themselves, such as mutual forward leaning in posture (Condon & Ogston, 1971). This is an important difference to behavioral matching. Whereas the focus of behavioral matching is on static and, especially qualitative properties of interaction, such as posture, behaviors and facial expressions, the nonverbal synchrony is something dynamic. This involves the wholeness of the body as well as global and quantitative elements, such as speed, duration and complexity of movements (Ramseyer & Tschacher, 2006). In addition, the nonverbal synchrony measures the (global) nonverbal communication of both partners at the same time and not only specific behaviors (e.g., gestures) of individuals. Thus, the nonverbal synchrony appears to be a better global measurement of movement in a dyadic conversation than constructs such as behavioral matching. Besides, nonverbal synchrony occurs in a conversation without conscious awareness and control of the interaction partners. This does not always apply to other forms of interpersonal coordination such as mimicry that can be consciously controlled to a certain degree (Tschacher, Rees, & Ramseyer, 2014).

Presumably, nonverbal synchrony has a communicative function because it brings interaction partners up to a shared level of communication. Thus, it enhances the quality of the interaction (e.g., Bernieri & Rosenthal, 1991; Burgoon et al., 1995; Chartrand & Bargh, 1999; Scheflen, 1964) and increases, for example, the cooperation (Wiltermuth & Heath, 2009) and the liking of interaction partners (Hove & Risen, 2009). Research assumes a bidirectional relationship between nonverbal synchrony and relationship satisfaction. A well-adjusted nonverbal synchrony seems to be a cause but can also be a consequence of a good and satisfying relationship (Chartrand & Bargh, 1999; Guéguen & Martin, 2009).

Research Question and Hypotheses

In consideration of the above mentioned reports that a high nonverbal synchrony in a conversation gives individuals the impression to be in a good and satisfying relationship (e.g., Bernieri & Rosenthal, 1991; Burgoon et al., 1995; Chartrand & Bargh, 1999; Hove & Risen, 2009; Scheflen, 1964; Wiltermuth & Heath, 2009), we assume that individuals who are high in their need for intimacy (unconsciously) try to attain nonverbal synchrony because they want to maintain or establish high intimacy in their conversation.

Though intimate relationships are an important field to express intimacy, not all persons who are engaged in a relationship have a strong need for intimacy. Consequently, this results in different possible implicit motive constellations in couples (e.g., one partner is high, the other partner is low in the need for intimacy). The individual motive disposition generates behavior that emerges as a dynamic product from the steady interaction of the individual motive disposition and the environment (McAdams & Powers, 1981). In other words, the motive-specific behavior in interpersonal interactions (e.g., establishing nonverbal synchrony) might change depending on the situation, for example depending on a specific motive disposition of an interaction partner. Thus, the motive constellation of both partners might influence how they behave in their interaction (e.g., if they try to attain nonverbal synchrony). This shows the relevance to consider the needs of both partners in such investigations of dyadic conversations. To date, research mainly focused on the association between individual needs and specific behaviors (e.g., smiling) in a conversation (at an individual level) but, to our knowledge, neither on the simultaneous consideration of both partners' needs, nor on the specific influence of intimacy needs on nonverbal synchrony. This article is the first attempt to investigate the influence of romantic partners' unconscious needs for intimacy on the unconscious nonverbal synchrony of their behavior in a conversation on a dyadic level.

We assume that the nonverbal synchrony of couples in a conversation should be high when both partners have a high need for intimacy. This might be due to two reasons: First, a high nonverbal synchrony could be the consequence of a harmonious relationship that might emerge if both partners are high in their need for intimacy. Second, a high nonverbal synchrony could emerge if both partners that are high in the need for intimacy try to establish or maintain intimacy in their relationship. Likewise, the nonverbal synchrony in the dyadic conversation should be high if only one partner has a high need for intimacy. Presumably, this partner unconsciously aligns his or her movement rhythm to the movement rhythm of the partner to compensate the missing match in the need for intimacy and to establish intimacy in the conversation. In addition, we hypothesize low nonverbal synchrony in conversations, when both partners have only a small need for intimacy. We assume that such couples are not interested in establishing intimacy in their relationship at all.

Furthermore, we expect that nonverbal synchrony influences the relationship quality. It has already been shown that, for example, the nonverbal synchrony of therapists and patients is positively related to their relationship quality and to psychotherapeutic outcomes (Ramseyer & Tschacher, 2011, 2014).Thus, we hypothesize that nonverbal synchrony is positively linked to relationship satisfaction, commitment and coping. However, the association between nonverbal synchrony and relationship quality has never been investigated in the context of intimate relationships.

Method

Participants and Procedure

The data for this study were collected in the context of a larger research project investigating intimate relationships and stress (c.f. Backes et al., 2016; Denzinger et al., 2016; Denzinger et al., 2017; Kuster et al., 2015; Landis et al., 2014; Neysari et al., 2016; Zemp, Bodenmann, Backes, Sutter-Stickel, & Bradbury, 2016; Zemp, Bodenmann, Backes, Sutter-Stickel, & Revenson, 2016). However, previous publications did not test any of the hypotheses presented in this article.

In total, 368 heterosexual couples participated in this study. Couples were invited to the laboratory and were requested to complete some questionnaires and the measurement of implicit motives as well as to discuss a conflictual topic that stresses both partners for eight minutes. These conflict talks were recorded with a digital video camera. Both partners were sitting next to each other on a sofa, and the camera was installed about 2.5 meters away in

front of them. The lightning conditions and the position of the camera remained unchanged across all couples, whereas the seating position and the distance to each other was due to the couples. Thirty-four couples had to be excluded according to missing data and unusable seating positions. Thus, data of 334 couples were used for further analyses. The mean age of women was *M* = 48 years, *SD* = 18 years (range: 19-80 years), and the mean age of men was *M* = 50 years, *SD* = 18 years (range: 20-82 years). The relationship duration of these couples was *M* = 22.5 years, *SD* = 18 years (range: 1-60 years).

Assessment of the Need for Intimacy

We measured the need for intimacy with the Picture Story Exercise (PSE; Schultheiss & Pang, 2007). This projective test is based on the Thematic Apperception Test of Morgan and Murray (1935). Individuals write imaginative stories to ambiguous pictures that depict persons in different situations (e.g., a couple sitting on a bench by a river). These pictures are deemed to arouse specific needs that were projected by the individuals into the imaginative stories (Schultheiss & Pang, 2007). These stories were rated with a standardized and validated coding system to determine the individual manifestation of the need for intimacy (McAdams, 1980). This system contains ten thematic categories whose presence and absence is rated in each story. Thus, the score of one story can range from zero to ten. Intimacy is coded when the individual describes a relationship that produces positive affect or when characters in the story verbally or nonverbally exchange information. If one or both situations are mentioned in a story, the rating of the following eight categories is continued: the described relationship leads to psychological growth, self-fulfillment or problem-solving for one character, a character feels commitment or concern for others, the described relationship transcends the limitations of time and/or space, the characters come together and reunite after being apart, the characters are described to be in harmony to each other, the characters surrender the manipulative control of the interaction, the characters actively escape from an non-intimate environment to an intimate environment, and/or a character opens up and connects himself to the outside world (e.g., nature; McAdams, 1980). The stories were rated by two intensively trained and independent coders who attained an interrater-reliability of at least .85 before they separately started rating the stories. We used a standardized approach to calculate the individual scores (Pang, 2010). The ratings of all six pictures were summed up to obtain one motive score for each person. This score was residualized for story length to control for verbal fluency.

Assessment of Nonverbal Synchrony

The synchrony of the nonverbal behavior in the conflict discussions was assessed with an objective and fully-automated computer program called Motion Energy Analyses (MEA; Ramseyer, 2017). This program quantifies the movement behavior of the interactants through detecting frame-by-frame changes in the gray-scale pixels of a digital video. Before analyzing the video material, we determined two spatial pre-defined regions of interest (the body and the head of both interactants) to quantify the movement behavior of the respective partners and to reduce signal distortion of the video. The output of this program is a time-series of movement change within a region of interest. To compute the nonverbal synchrony of couples, the time-series of women and men were cross-correlated in window segments of 30 seconds duration with time-lags up to ±5 s. The cross-correlations were then standardized (Fisher's Z) and their values were aggregated over the entire 8-minute video interval. To control for coincidental synchrony, we generated pseudointeractions by windows-wise shuffling the genuine data. Thus, the final score of nonverbal synchrony is controlled for these spurious influences.

Assessment of Relationship Quality

The relationship quality was assessed with three different scales measuring relationship satisfaction, commitment, and coping.

Relationship satisfaction. The relationship satisfaction was measured with a German version of the Relationship Assessment Scale (RAS; Hendrick, 1988; Sander & Böcker, 1993). Seven items assessed the general relationship satisfaction (e.g., "In general, how satisfied are you with your relationship?") on a 5-point scale ranging from 1 (*low satisfaction*) to 5 (*high satisfaction*). We calculated the mean score of these items. Higher scores represent a higher relationship satisfaction.

Commitment. The commitment of spouses was measured with the seven items assessing the commitment level of the Investment Mode Scale from Rusbult, Martz, and Agnew (1998) (e.g., "I want our relationship to last for a very long time"). The items were to be rated on a 7-point scale ranging from 1 (*not at all*) to 7 (*completely*). We used the mean score of these items for further analyses. The higher the score, the higher the commitment level.

Coping. The dyadic coping was measured with the Dyadic Coping Inventory (DCI) from Bodenmann (2008). We calculated the mean score of 37 items measured on a 5-point scale. Higher scores stand for a better dyadic coping of the respective person. This scale

contains questions about the stress communication by oneself (e.g., “If I am overburdened, I ask my partner to take up duties and tasks”), about the reaction of the partner on the stress communication (e.g., “He helps me to see the situation from a different perspective and to put the problem into perspective”), about the stress communication by the partner (e.g., “He asks me to take up duties and tasks”), about the own reaction on the stress communication of the partner (e.g., “If my partner is stressed, I lend a hand to help him”), about joint dyadic coping (e.g., “We try to tackle problems together and to find concrete solutions”), and about the evaluation of dyadic coping (e.g., “I am satisfied with the support from my partner and with shared stress management”).

Results

Data Analysis Plan

In a first step, we compared the score of nonverbal synchrony to a score of pseudosynchrony derived from shuffled data to prove that nonverbal synchrony was present in the conversations of the couples at a level above chance.

In a second step, we investigated the relationship between the constellations of partners’ need for intimacy and the nonverbal synchrony. We used polynomial regression, response surface analysis (RSA), and a three-dimensional response surface plot (Edwards, 2002) to analyze this relationship. Polynomial regression analysis is an extension of the moderated regression analysis. This statistical method can provide information about how congruence and incongruence of partners’ need for intimacy relates to nonverbal synchrony. The model predicted nonverbal synchrony by two linear terms (woman’s need for intimacy and man’s need for intimacy), their interaction and their quadratic terms. The response surface analysis uses these regression coefficients to calculate surface parameters that help to determine the congruence and incongruence of the predictor variables on a three-dimensional surface plot. These parameters allow to interpret the line of congruence (e.g., is there a difference in nonverbal synchrony if both partners are congruently high or low in their need for intimacy?) and the line of incongruence (e.g., how is the nonverbal synchrony influenced by the “disagreement” of partners in their need for intimacy?). In addition, we compared models with different constraints to determine the most parsimonious model with the best model fit. Afterwards, we plotted the best fitting model on a three-dimensional response surface to visualize the results. All analyses were conducted with the statistical software R (R Core Team, 2015) and the RSA-package (Schönbrodt, 2015).

In a third step, we were interested in the influence of nonverbal synchrony on the relationship quality, namely relationship satisfaction, commitment, and coping. Thus, we first analyzed the association between nonverbal synchrony and the respective variables measuring relationship quality. Then, we used structural equation modelling to analyze a dyadic mediated moderation model to take the influence of the need for intimacy into account (Figure 2). Relationship satisfaction, commitment and coping of women and men were predicted in three different models by two linear terms (women's and men's need for intimacy), their interaction and their quadratic terms. This relationship was mediated by the nonverbal synchrony. All variables were controlled for relationship duration. We imposed different constraints to the respective models to determine the most parsimonious and best fitting model. These analyses were conducted with the software IBM Amos 23.0 (Arbuckle, 2014).

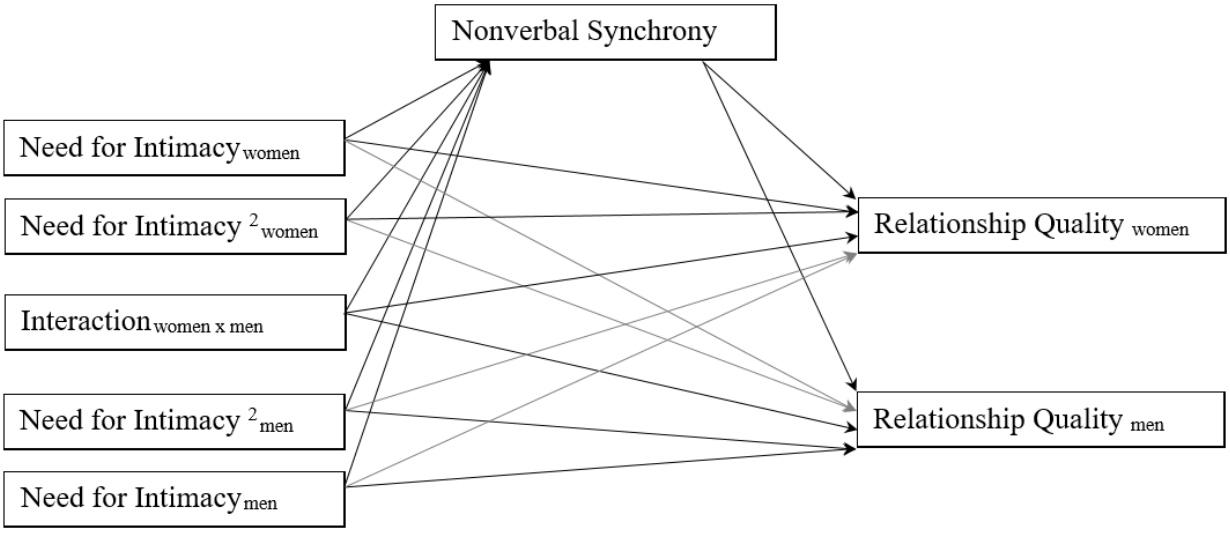

Figure 2. A simplified depiction of the model for analyzing the dyadic mediated moderation. Covariances and error terms are included in the model, but not depicted. All variables were controlled for relationship duration. Gray paths represent the respective partner effects. Depending on the respective model, relationship quality is a wildcard for relationship satisfaction, commitment or coping.

Nonverbal Synchrony of Couples

The comparison of the nonverbal synchrony score to the score of the pseudosynchrony revealed that couples showed a nonverbal synchrony in the conflict discussions that differed significantly from chance. Across all couples, nonverbal synchrony was significantly higher

than pseudosynchrony ($M_{synchrony}$ = 0.124, *SD* = 0.020 vs. $M_{pseudosynchrony}$ = 0.117, *SD* = 0.015), *T*(133) = 11.84, *p* < .001.

Spouses' Need for Intimacy and their Nonverbal Synchrony

Table 17 presents the results of the polynomial regression and the response surface analysis. In addition to the coefficients of the polynomial regression, the table includes the surface parameters a1 to a4. These parameters are central to the analysis because they give information about congruence and incongruence in partners' need for intimacy. The response surface analysis of the full model revealed a significant curvature effect of the predictor mean level along the line of incongruence, in other words, a non-linear relationship (a4: *b* = .37, *p* = .01). Nonverbal synchrony increased when the two partners were incongruent in their need for intimacy – regardless of the direction. We selected a more parsimonious squared difference model (SQD) for further analyses because a comparison of models with different constraints on their parameters determined it as the best fitting model. This model also revealed a significant non-linear relationship along the line of incongruence (a4: *b* = .29, *p* = .01).

Figure 3 depicts the surface plot of this model and brings more clarity to these relationships. The line in the middle from the front to the back reflects the line of congruence. The back corner indicates that both partners are high in their need for intimacy, while the front corner represents the opposite. The line from the left corner to the right corner is the line of incongruence. The left corner indicates that men's need for intimacy is high and women's low, the right corner indicates that women's need for intimacy is high and men's low. This plot does not support our hypotheses that nonverbal synchrony is high when both partners are high in their need for intimacy. It shows that the nonverbal synchrony of couples is only high, when either women or men are high in their need for intimacy.

Table 17

Polynomial Regression and Response Surface Analysis for Nonverbal Synchrony

	Full model					SQD model				
				95% CI [a]					95% CI [a]	
Parameter	*B*	*SE B*	*p* [a]	lower bound	upper bound	*B*	*SE B*	*p* [a]	lower bound	upper bound
Intercept	.898	0.118	.000 ***	0.667	1.129	.867	0.094	.000 ***	0.683	1.052
Need for Intimacy women	-.079	0.101	.428	-0.269	0.124					
Need for Intimacy men	.122	0.124	.372	-0.125	0.362					
Squared need for intimacy women	.145	0.073	.045 *	0.004	0.298	.072	0.031	.014 *	0.016	0.148
Squared need for intimacy men	-.022	0.041	.625	-0.115	0.062	.072	0.031	.022 *	0.016	0.148
Interaction	-.251	0.101	.013 *	-0.464	-0.053	-.144	0.063	.014 *	-0.295	-0.032
a1	.043	0.124	.739	-0.210	0.278					
a2	-.129	0.107	.237	-0.370	0.071					
a3	-.201	0.190	.324	-0.577	0.176					
a4	.373	0.148	.011 *	0.089	0.685	.288	0.125	.014 *	0.064	0.591

Note. a1 represents a linear effect of the predictor mean level along the line of congruence; a2 represents a curvature effect of the predictor mean level along the line of congruence; a3 represents a linear effect of the predictor mean level along the line of incongruence; a4 = represents a curvature effect of the predictor mean level along the line of incongruence. This is the central parameter for congruence hypotheses.

The comparison of the model fit of the full against the SQD models yields the following parameters: full: R^2 = .046, R^2_{adj} = .030, p = .009, AICc: 6697.24; SQD: R^2 = .027, R^2_{adj} = .020, p = .003, AICc: 6695.56.

Some of the paths of the basic squared difference model (SQD) were imposed with constraints and set to zero. The paths from both linear terms to the dependent variable were set to zero, and the paths of the squared linear terms are constrained to be equal.

* p < .05. *** p < .001.

[a] Confidence intervals and significance scores are calculated using bootstrapping techniques with 2000 resamples.

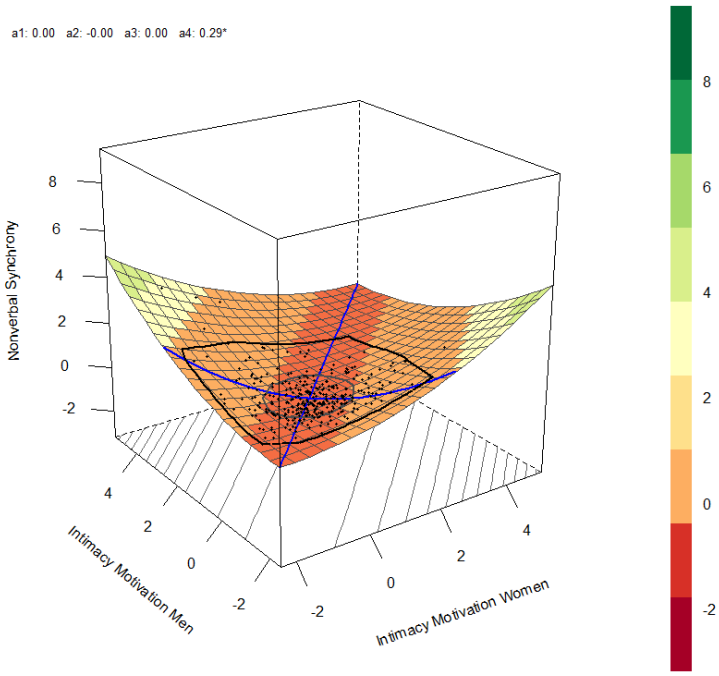

Figure 3. Response surface analysis plot for nonverbal synchrony.
The plot is based on polynomial regression analysis.

Influences on the Relationship Quality

Table 18 presents the coefficients for the regression of variables measuring the relationship quality on nonverbal synchrony. We analyzed three different models with the respective outcome variables measuring relationship quality. Nonverbal synchrony is positively related to relationship satisfaction (b = .04, p =.01), commitment (b = .04, p = .00), and dyadic coping (b = .03, p = .03). All variables were controlled for the influence of relationship duration.

Table 18

Regression Analyses of Variables Measuring Relationship Quality on Nonverbal Synchrony

	Estimates				**95% CI**		**Model Fit Indices**		
Variable	*B*	*SE B*	β	*p*	lower bound	upper bound	χ^2/DF	CFI	RMSEA
Relationship satisfaction	.037	0.015	.128	.01 **	.008	.067	0.29	1.00	.00
Commitment	.041	0.015	.110	.00 **	.013	.073	0.14	1.00	.00
Coping	.032	0.015	.123	.03 *	.032	.063	1.33	1.00	.03

Note. This table combines the results of three different analyses (relationship satisfaction, commitment, and coping). Standard errors, significance scores, and confidence intervals are calculated using bias corrected bootstrapping techniques with 2000 resamples. Gender effects were constrained to be equal. All variables were controlled for relationship duration.
* p < .05. ** p < .01.

Furthermore, we analyzed an additional model to take the influence of spouses' need for intimacy into account. Table 19 contains the coefficients of the model as exemplified in Figure 2. Again, we analyzed three different models using relationship satisfaction, commitment and coping as outcome variables. The analyses yielded a marginally significant direct effect of women's and men's need for intimacy on relationship satisfaction (b = .03, p = .06) and a significant direct effect of the squared need for intimacy on dyadic coping (b = .02, p = .04). These results indicate that there is a (small) positive relationship between spouses' need for intimacy and relationship satisfaction as well as dyadic coping. However, analyses indicated significant indirect effects of the interaction term (women's need * men's need) on relationship satisfaction (b = -.01, p = .01), commitment (b = -.01, p = .01), and coping (b = -.01, p = .02). These results show that the relationship between the need for intimacy and relationship quality is mediated through nonverbal synchrony if only one partner has a strong need for intimacy.

Additional Analyses

The response surface analyses indicated that nonverbal synchrony is high, when only one partner has a high need for intimacy. It is conceivable that the partner who is higher in the need for intimacy (unconsciously) adapts to the nonverbal behavior of his or her partner to establish synchrony. Therefore, we analyzed the relationship between the motive constellation in the couples and the direction of imitation. We identified the partner who followed the other partner by a time lag of up to 5 seconds by calculating a difference score of women's and men's time lagged cross-correlations. A lower score indicates that the woman is nonverbally following her partner most of the time in the discussion. We correlated this score to a difference score indicating the motive constellation of the respective couple. A higher score signals that the woman is higher in her need for intimacy than the man. The analysis yields a negative but non-significant correlation (r = -.06, p = .13, one-tailed). In other words, we found no significant evidence but a tendency that partners who are higher in the need for intimacy nonverbally follow the movements of his or her partner. This might be a first tentative evidence that partners who are high in the need for intimacy (unconsciously) adapt to the behavior of his or her partner to establish synchrony.

Table 19

Dyadic Mediated Moderation Models

		Relationship Satisfaction			**Commitment**			**Coping**		
Predictors	Intimacy $_{women}$	*B*	*SE B*	*p*	*B*	*SE B*	*p*	*B*	*SE B*	*p*
	direct effect	.034	0.018	.056 †	-.007	0.027	.799	.003	0.018	.815
	indirect effect	.000	0.002	.812	.000	0.003	.849	.000	0.002	.799
	Intimacy $_{men}$									
	direct effect	.034	0.018	.056 †	-.007	0.027	.799	.003	0.018	.815
	indirect effect	.000	0.002	.812	.000	0.003	.849	.000	0.002	.799
	Intimacy$^2_{women}$									
	direct effect	.003	0.011	.757	.014	0.012	.252	.022	0.009	.039 *
	indirect effect	.002	0.001	.116	.002	0.002	.125	.001	0.001	.131
	Intimacy$^2_{men}$									
	direct effect	.003	0.011	.757	.014	0.012	.252	.022	0.009	.039 *
	indirect effect	.002	0.001	.116	.002	0.002	.125	.001	0.001	.131
	Interaction									
	direct effect	-.001	0.023	.953	.016	0.025	.492	.011	0.021	.627
	indirect effect	-.008	0.005	.013 *	-.010	0.006	.012 *	-.007	0.004	.023 *
Mediator	Synchrony									
	direct effect	.036	0.015	.013 *	.040	0.016	.007 **	.031	0.015	.037 *

Note. This table combines the results of three different analyses (relationship satisfaction, commitment, and coping). Analyses are controlled for relationship duration. Standard errors and significance levels are calculated using bias corrected bootstrapping techniques with 2000 resamples. Gender effects were constrained to be equal. Fit indices of the models: Relationship satisfaction: $\chi 2/DF = 1.068$, CFI = .999, RMSEA = .014. Commitment: $\chi 2/DF = 1.023$, CFI = .999, RMSEA= .008. Coping: $\chi 2/DF = 2.067$, CFI = .975, RMSEA = .057

† $p < .10$. * $p < .05$. ** $p < .01$.

Discussion

This article demonstrates that spouses' need for intimacy is related to the nonverbal synchrony of behavior in a dyadic conversation. Interaction partners show a high degree of nonverbal synchrony if only one partner has a high need for intimacy, the other partner a low need for intimacy. However, contrary to our assumptions, couples do not act in nonverbal synchrony if both partners are high in their need for intimacy. The same result shows up for partners, who are both low in their need for intimacy. Furthermore, nonverbal synchrony is positively related to variables measuring relationship quality. It mediates the relationship between interaction partners' constellation in the need for intimacy and relationship satisfaction, commitment and coping. These findings will be discussed in the following sections.

We assumed that the partner with a high need in intimacy uses the nonverbal synchrony (unconsciously) to establish harmony in the relationship and, more specifically, to obtain a positive outcome in conflict discussions. Thus, this behavior might be beneficial for couples' relationships. Further analyses showed a tendency that the partner who is high in the need for intimacy adjusts his or her nonverbal behavior to the movement of the interaction partner who is low in the need for intimacy. Besides, the nonverbal synchrony is related to relationship quality. This points to the functional character of the nonverbal synchrony as it might facilitate the expression of intimacy. Nonverbal synchrony seems to be rather a cause than a consequence of a harmonious relationship.

We hypothesized that this synchronization especially shows up if both interactants are high in their need for intimacy. However, according to our data, a high congruence in partners' needs for intimacy seems to have no influence on the nonverbal synchrony.

There are at least two plausible explanations for this phenomenon. First, if both partners try to adapt their nonverbal behavior to the "rhythm" of the partner and try to regulate the nonverbal synchrony to establish harmony, they might interfere with each other. This can be illustrated with an example in the context of ballroom dance: If dancing partners cannot agree on the person who is leading, they are treading on another's toes and will never find the right rhythm. In almost the same manner, partners might get in the way of each other, when they try to facilitate intimacy. This might lead to lowered nonverbal synchrony scores if both partners are high in the need for intimacy.

Second, partners who are both high in the need for intimacy might mutually satisfy their need for intimacy throughout their relationship. Thus, there might be no necessity to adjust the rhythm of their movements in one single discussion to satisfy their need for intimacy and to obtain a positive outcome. These couples can rely on a high overall intimacy in their relationship because high levels of intimacy are accompanied by high levels of trust and security (McAdams & Bryant, 1987; McAdams, Healy et al., 1984). Thus, despite the fact that high conflict interactions, such as the discussions our couples went through, activate concerns about the security of the relationship (Pietromonaco & Barrett, 1997), high intimacy couples might be protected from these concerns, but not couples who are not congruently high in their need for intimacy. Therefore, short-term disagreements cannot negatively affect the relationships of spouses who are both high in their need for intimacy. This might allow both partners to pursue and satisfy other personal goals and needs in their discussion (e.g., to impose own opinions on the partner). It is already evidenced that a balanced need satisfaction has positive effects on the well-being (Sheldon & Niemiec, 2006). Consequently, such couples might prioritize the pursuit of other needs than the need for intimacy in their conflict discussions. As a result, the nonverbal synchrony of such spouses is reduced.

We want to mention two limitations of our findings. Firstly, small effect sizes are limiting our results. Research mentions that a large percentage of variance remains unexplained because the unconscious need for intimacy and the nonverbal behavior, including nonverbal synchrony, are dependent on various factors in person and environment (McAdams, 1984). This might be one reason for the small effect sizes of our results. Additionally, methodological variability in the assessment (projective test and observation of behavior) and the unconscious nature of both variables might result in weak statistical relationships. Although our sample has a lot of power to detect reliable results, it is necessary to replicate these findings with further studies.

Secondly, we had to exclude spouses from analyses who sat too close to each other and/or frequently touched each other. As a matter of fact, the automated movement detection of the software MEA is not able to differentiate between the movements of the two partners in such cases. The software would identify the movement of one partner as the simultaneous movement of both partners. At worst, this would lead to the detection of a false synchrony. Besides the loss of statistical power, the exclusion of these couples might also lead to a selection bias. Spouses, who are physical close to each other might also be high in the need for intimacy and in relationship quality. Therefore, we analyzed the differences between the

group means of these variables of included and excluded couples. The analyses did not yield significant differences in the need for intimacy (women: $F(1, 360) = 0.08$, $p = .78$; men: $F(1, 361) = 0.08$, $p = .77$), in relationship satisfaction (women: $F(1, 361) = 0.38$, $p = .54$; men: $F(1, 361) = 0.07$, $p = .79$), in commitment (women: $F(1, 360) = 0.40$, $p = .53$; men: $F(1, 361) = 0.56$, $p = .46$), and in dyadic coping (women: $F(1, 360) = 3.25$, $p = .07$; men: $F(1, 361) = 2.10$, $p = .15$). These results suggest that the excluded couples are not significantly different from couples that are included in our analyses.

In sum, our research provided first evidence that the coordination of nonverbal behavior has a functional character to establish intimacy. It is (unconsciously) employed if only one interaction partner has a high need for intimacy. In this case, it helps to improve the relationship quality. If both interaction partners have a high or low need for intimacy, respectively, they do not synchronize their nonverbal behavior.

General Discussion

The objective of this thesis was to examine, whether implicit motives are susceptible to change over the course of life. For this purpose we built our research on findings from the domain of personality research documenting life-long changes in important characteristics of personality (Roberts et al., 2006; Specht et al., 2011). The main questions that guided our research were whether there is evidence for changeability in implicit motives in present research, which factors are responsible for changes in the individual implicit motive disposition, and which consequences specific changes in implicit motives have for the individual life.

Summary of the Present Findings

This thesis begins with a general review of existing studies that investigated the stability and the changeability of implicit motives. It summarizes theoretical assumptions, results, and interpretations of studies analyzing the experimental arousal of implicit motives, of studies investigating specific age differences in implicit motives, and of studies longitudinally investigating implicit motive scores. The studies on motive arousal indicated that implicit motives could change according to arousing cues, such as specific movie excerpts, pictures, or exercises. However, these changes are only short-term and might also be due to influences on the measurement of implicit motives (e.g., the arousal causes an increased fantasy production). Studies that investigated age differences in implicit motives revealed that changed life situations, transitions, cognitive changes, and physiological changes might influence implicit motive scores over the course of life. These studies evidenced long-term changes in implicit motives which could also be due to age-dependent influences on the measurement (e.g., age dependent problems in recognizing the picture cues of the PSE) or simply to cohort effects. Longitudinal analyses can overcome these problems. The longitudinal studies that were reviewed found that implicit motives did actually change according to learning experiences, age-related changes, and specific life events. In sum, the first part of this thesis captures the current state of research on changeability of implicit motives and documents that implicit motives are susceptible to change over the course of life.

The second part of this thesis deals with one important factor that might influence implicit motive scores because it is omnipresent and affects everyone: the individual's age. This variable seems to be very important because individuals undergo various changes throughout their lives (e.g., transition into parenthood, menopause) that might influence their

implicit motive disposition. Our empirical analysis documents significant age differences in the implicit achievement, power, affiliation, and intimacy motive. All motive scores were smaller in older adults in comparison to younger adults. These results can be explained by age-differences in affective and neuroendocrinological reactivity. Older adults are less responsive to emotional stimuli than younger adults (Röcke & Brose, 2013) and, thus, might respond less to affective incentives that activate the implicit motives. In addition, the hormonal responses of older adults are attenuated (Conrad & Bimonte-Nelson, 2010; Ferrari et al., 2001; Ferrini & Barrett-Connor, 1998). This might reduce the rewarding experience of motive-driven behavior resulting in a long-term decrease of implicit motives. To sum up, the second part of this thesis documents a significant influence of age on implicit motives. Presumably, implicit motives change as a consequence of age-dependent affective and physiological maturation.

The third part of this thesis is dedicated to the empirical investigation of the long-term influence of specific life circumstances on the individual implicit motive disposition, namely the influence of an important living condition: the intimate relationship with another person. We investigated the similarity of spouses regarding their life goals and implicit motives and examined if couples' relationship duration is one predictor of similarity. The results indicated a similarity in life goals, but no increase in spouses' similarity in their life goals with longer relationship duration. However, our findings document a positive relationship between spouses' similarity in implicit motives and relationship duration. Spouses converge to each other in their implicit motive dispositions with increasing relationship duration. We assumed that shared and long-term affective learning experiences are responsible for these convergence effects in implicit motives. In short, the third part of this thesis demonstrates that specific living conditions, such as long-term intimate relationships, can influence the individual implicit motive disposition.

The fourth part of this thesis examines the concrete consequences of the above-mentioned convergence effect in implicit motives (e.g., partners are highly similar in their implicit intimacy motives) on an everyday life situation: the dialog between two partners and their specific nonverbal communication patterns. This research investigates how partners' motive constellations of the implicit intimacy motive (e.g., both partners high in the implicit intimacy motive) influence the coordination of their nonverbal behavior in a conflict discussion. We assumed that partners who are both high in their implicit intimacy motive coordinate their movements to re-establish or maintain intimacy in their relationship resulting

in a high nonverbal synchrony. Our results documented that partners showed a high degree of nonverbal synchrony if only one partner had a high implicit intimacy motive. On the one hand, this finding underlines the functional character of the nonverbal synchrony to compensate the missing match of both partners in their implicit intimacy motive. On the other hand, it indicates that spouses who are similar to each other in their implicit intimacy motive do not adjust their nonverbal movements in one single discussion. Presumably, their relationships are robust enough so that it is not necessary to (re)establish intimacy after a dispute. To summarize, the fourth part of this thesis indicates that convergence effects in implicit motives might be beneficial for the communication in a relationship. Probably, partners who are similar in their implicit intimacy motive disposition do not face the necessity to use nonverbal strategies for enhancing the communication and to re-establish intimacy.

To briefly wrap up the findings of the four parts: We identified various factors in existing research that influence implicit motive scores over the course of life (e.g., life circumstances, psychological and physiological changes). In addition, we validated some of the reviewed findings about changes in implicit motives with our own empirical research, showing a significant influence of age and specific life circumstances (being in an intimate relationship) on the individual motive disposition. Finally, we analyzed possible consequences of implicit motive dispositions on the dyadic communication in the relationship. However, before drawing final conclusions of the presented research, some important limitations have to be discussed.

Strengths and Limitations of the Present Research

The present research was conducted within a large study that is operated in cooperation with multiple research labs of the University of Zurich and financed by the Swiss National Science Foundation (SNSF: CRSI11_133004/1). The study includes *N*=368 heterosexual couples with a broad range regarding age (20 years to 80 years), relationship duration (1 year to 60 years), and socioeconomic background. It is unique in its structure among studies in the German speaking area because it collects dyadic data through various questionnaires and even through several behavioral observations. Further, this study aims to examine romantic relationships over time. Hence, couples are contacted yearly (wave 1-7) and asked to participate in the study. Many experts from different research fields (e.g., psychology of motivation, clinical and developmental psychology, methods and statistics) work together closely and ensure that the project is well-structured and organized, that its surveys are reliably conducted using standardized procedures, and that the resulting data is

repeatedly and carefully checked. However, the data on which our results are based on is only assessed in one single sample. One might argue that findings based on one single dataset are not credible, reliable, and generalizable. It would be important to replicate the empirical findings by conducting further studies before generalizing the findings to other populations. Due to circumspective planning, our sample has high statistical power to find reliable results, given its large size. Recent research indicates that one highly powered study might even achieve more reliable results than conducting many small studies (Spellman, Gilbert, & Corker, 2017). Statistical simulations demonstrate that «more publishable results do not necessarily mean more true results» (Spellman et al., 2017, p. 32). Highly powered studies revealed in these simulations more "true positives" than the approach of conducting many small studies (Gervais, 2016; Spellman et al., 2017). Thus, our approach of conducting only one highly powered study instead of conducting many small studies is not necessarily a disadvantage. Nonetheless, it is important to re-examine our assumptions with further highly powered studies to increase the credibility and generalizability of our results.

A possible limitation of the present research is the use of cross-sectional designs (with the exception of a longitudinal analysis of changes in life goals). Indeed, our study includes multiple measurement points, but we had to reduce measurements wherever possible to find the best compromise between collecting necessary information and minimization of subject burden. The assessment and coding of implicit motives is very time-consuming and labor-intensive. As a consequence, implicit motive scores were only assessed at the first measurement point (in the year 2012/2013). A second assessment of implicit motives within only a few years would not have generated added value to our research because we assume that a possible change in implicit motives would take some years. Therefore, the effort of a short-term follow-up assessment of implicit motives was not reasonable enough to burden our subjects and to invest the time and resources needed for the motive coding. Nevertheless, it is absolutely necessary to verify our results with longitudinal analyses to generate compelling evidence for our findings. It would be advisable to re-assess the implicit motive dispositions of our subjects in one of the next survey waves, since more than five years have passed since the first measurement of implicit motives. Hence, sufficient time may have passed for giving way to possible environmental influences on implicit motives.

Another limitation is due to the uncertainty of whether it is only the sensitivity of imaginative thoughts for environmental influences that is responsible for changed implicit motive scores. For example, some researchers assumed that specific environmental incentives

stimulate the fantasy production and situationally change the content of the written imaginative stories (e.g., McClelland et al., 1972; McClelland & Winter, 1969; Wiemers et al., 2015; Wirth & Schultheiss, 2006). Changed implicit motive scores reflect exactly this change in the content of the stories (e.g., more power content is coded as a higher implicit power motive). So, one might argue that changes in implicit motives are merely due to a stimulation of the fantasy production and not to a change in the motive disposition itself. Although this objection might be justified in the case of short-term arousal of implicit motives, a stimulated fantasy production is an important preceding condition for long-term changes in implicit motives. If these imaginative thoughts were, for example, positively evaluated and accompanied by specific affects, they might trigger a change in implicit motives. Besides, this objection only applies to studies that situationally aroused implicit motives in the short-term. If the content of the stories is permanently changed (as it is exactly the case in studies investigating implicit motives with longitudinal methods or age-group comparison), it is a strong indication that the underlying implicit motive disposition has changed.

Practical Implications

Implicit motives have far-reaching consequences for the human behavior (McClelland, 1985; Schultheiss, 2008) and are, for example, related to emotional and physical well-being (e.g., McAdams & Vaillant, 1982; Zeldow, Daugherty, & McAdams, 1988), health (for an overview: McClelland, 1989; Schultheiss, 2008), managerial success (e.g., Jacobs & McClelland, 1994), and relationship satisfaction (e.g., Hagemeyer et al., 2013). This highlights the importance of implicit motives for many areas of individual living and the coexistence of humans. The present thesis indicates that implicit motives are changeable and, thus, lays the foundation for widespread practical implications. For instance, it could bring the trainability of implicit motives to researchers' and practitioners' focus of attention again. Whereas previous interventions mostly taught skills, more or less successfully, on a behavioral level (e.g., McClelland & Winter, 1969; Rheinberg & Engeser, 2010), future training programs should be based on repeated affective learning experiences. This may not only be useful for improving economic achievement and setting up a leadership-motive pattern (e.g., McClelland & Boyatzis, 1982), but also to attain a congruence between implicit motives and specific goals. A motive-goal-congruence is deemed to be associated with positive outcomes such as health and well-being (e.g., Brunstein et al., 1998; Hofer & Busch, 2013; Hofer, Busch, Bond, Li et al., 2010; Hofer & Chasiotis, 2003; Hofer et al., 2006). Up to

now, trainings that are specialized on increasing the motive-goal-congruence (e.g., Kehr, 2009) are mostly interested in changing the respective conscious goals because this can be easily realized through cognitive restructuring and setting new goals. However, sometimes individuals do not want to or cannot abandon specific goals (e.g., caring for their children, working to earn a living). Therefore, the underlying implicit motives have to be adapted to these goals to reduce the hidden stressor resulting from the motive-goal-incongruence. This thesis gives a possible indication that a change of the individual implicit motive disposition is possible.

An induced change in implicit motives might also be important for interventions and therapeutic processes in intimate relationships and opens up a whole new range of applications in couple therapy. It has already been shown by research that relationships can be threatened by decreased relationship satisfaction and, in the worst case, by separation of both partners, if constellations of the partners in dimensions similar to implicit motives do not match each other. For example, spouses who are complementary in dominance (e.g., one partner is dominant and the other partner is submissive) reported more satisfaction than partners similar to each other, whereas a similarity in affiliation and intimacy might be more beneficial for the relationship than a complemental constellation (e.g., Dryer & Horowitz, 1997; Horowitz et al., 2006; Markey & Markey, 2007). To date, couples with a lack of fit in these dimensions might have to face difficulties in their relationships. If it could be shown that these dimensions are actually equivalent to respective implicit motives, specific training programs that aim to change implicit motives could help to increase the fit between both partners and, thus, increase the relationship satisfaction of many couples.

Theoretical Implications and Future Directions

Existing research is based on the theoretical assumption that implicit motives are learned in early, prelingual childhood and remain relatively stable over the course of life (McClelland, 1985). This thesis indicates that the underlying theoretical model should be adapted. Specific learning processes do not only occur in early childhood, but also to a certain degree in adolescence and adulthood. Admittedly, McClelland (1958) might be right in his assumption that implicit motives can develop better in childhood than in adulthood. One possible reason for this might be that children are not, or only to a small degree, motivationally afflicted. For example, they have made only few experiences in their relatively short lifetime that hinder the development of potential implicit motives. Adults, on the contrary, have often made contradictory affective experiences (e.g., a striving for influence

does not lead to well-being but to negative consequences) that cannot be easily unlearned and forgotten (McClelland, 1958). Presumably, this complicates the acquisition and the change of implicit motives in adolescence and adulthood. However, it is completely unclear how many experiences are necessary to form or change implicit motives. Also, it is not known whether such experiences have to be of a certain intensity to exert any influence on motive change or acquisition. Hence, this does not imply that a change of implicit motives in adulthood is impossible. Even McClelland (1958) acknowledged that a change of implicit motives is theoretically possible. Apparently, the influence of affective experiences that are acquired over the course of many years or the influence of critical life events that can change an individual life situation all of a sudden, have not been considered in the theoretical conception of implicit motives and in the corresponding empirical research. It is important to highlight the lifelong changeability of such personality characteristics because various implications, such as the above mentioned, can be derived from this.

What are the implications of our findings for future research? Researchers should be aware that implicit motives can be influenced through short-term manipulation but that they may also change in the long-term. This is especially important for studies that investigate individual motive dispositions in different contexts (e.g., a study in the context of achievement versus a study in the context of intimate relationships). These contexts might cause a high activation of implicit motives that does not have to be as strong in another (unaroused) situation. Thus, the assessment of implicit motives would be biased. Consequently, it is strongly recommended to control for environmental influences when measuring implicit motives (e.g., through the assessment of implicit motives in a neutral and standardized environment).

Our findings are also relevant for studies that analyze implicit motive scores in samples including individuals of different ages or for studies that investigate implicit motives longitudinally over the course of many years. Researchers should be aware that specific life circumstances might cause changes in implicit motive scores resulting in a biased interpretation of their results. The study of McClelland and Pilon (1983) is an example of possible biases with regard to the interpretation of their results. In this study, mothers had first been asked about their parenting practices and around 25 years later the implicit motive scores of their children were assessed. The researchers analyzed the relationship between children's implicit motive dispositions and the parenting practices of their mothers. They assumed that specific parenting practices of the mothers are the antecedents of specific implicit motives of

the children. It is possible that these conclusions are biased because the implicit motive scores of the children could have changed within the past 25 years after they experienced their mother's child-rearing practices before motive assessment. Such studies should analyze individual life trajectories and definitely take possible life circumstances into account.

However, our findings only scratch the surface of developmental processes in implicit motives. There are still a lot of open and unanswered questions. For example, what is exactly necessary to change implicit motive scores? Does it need years of environmental influence, or is one critical life event sufficient for a change? There are already arguments that only one critical life event (e.g., loss of a spouse) can change personality characteristics and the general motivational concern and, thus, also the implicit motive disposition (Specht et al., 2011; Veroff et al., 1960). However, we assume that this might be a rare exception and not the rule. It is more conceivable that it takes years of change in affective experiences to influence the individual implicit motive disposition. It is completely unclear how long it takes exactly to change implicit motives and to what extent these changes occur. Researchers who investigated the development of implicit motives in childhood assumed, for example, that implicit motives are formed in the phase before language acquisition (McClelland, 1985; Weinberger & McClelland, 1990). Relying on this assumption, this process is supposed to last about two years. Presumably, a similar developmental process in adolescence or adulthood takes much more time because the learning process is interfered by various factors (e.g., existing affective experiences, contradictory norms). The learning process might also depend on specific individual characteristics (e.g., openness to new experiences, self-consciousness) or characteristics of the learning situation (e.g., its intensity). It still remains unclear if individuals have specific predispositions and characteristics that help them to develop or change a certain motive and if all individuals are able to adapt their implicit motive disposition to the environment.

This thesis indicates that specific arousal conditions increase implicit motive scores. But it is also possible that implicit motives are not only sensitive to the presence but also to the absence of environmental stimuli (Hofer, 2010). Hence, the absent arousal of implicit motives might also cause increased implicit motive scores. This is comparable to the (motivational) satisfaction principle in sexual desires: Sexual desires increase when opportunities for satisfaction are not available (Gebauer, Baumeister, Sedikides, & Neberich, 2013). We did not address the absence of motivational arousing stimuli in our research but we suggest it as an interesting avenue for future research. Presumably, the absence of specific

arousal cues might cause a temporal and short-term increase of implicit motives, but, in the long run, a decrease in implicit motives according to the lack of affective and rewarding learning experiences. This process might be similar to sexual desires that have been found to decrease when they are not satisfied over a long time span (e.g., Gebauer et al., 2013; Impett, Strachman, Finkel, & Gable, 2008; Levine, 2002). In sum, this thesis lays the foundation for various new and interesting research questions, however, a lot of work remains to be done by future research.

Conclusion

The present thesis focusses on the changeability of implicit motives. It shows that the individual implicit motive disposition is actually susceptible to change, like other characteristics of personality. This conclusion is confirmed by a comprehensive review of existing literature and empirical research on this topic as well as by own empirical investigations that analyze two possible factors influencing the individual implicit motive disposition: age and intimate relationships. Finally, this thesis reveals that changes in implicit motives can be adaptive and, thus, can influence the communication in intimate relationships. Consequently, this research opens doors for further discussions and empirical work that might lead to new and valuable findings concerning implicit motives.

In sum, individuals adapt their implicit motives to specific life circumstances, such as age-dependent maturation and the relationship with an intimate partner. Referring back to the introductory quote: “Change is the law of life” (Kennedy, 1963), this seems also to be true for implicit motives.

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